J. Agric. Sci. Mansoura Univ., 31 (10): 6799 - 6808, 2006

CONCENTRATION OF SOME HEAVY METALS IN SOILS AND OLIVE TREES AS INDICATOR FOR ENVIRONMENTAL POLLUTION OF HEAVY TRAFFIC ROADS IN EGYPT

Amer, M. A.* and Afaf M. A. Yousif**

*** Soil, Water and Environment Research Institute, A. R. C.**

**** Horticulture Research Institute, A. R. C.**

ABSTRACT

Soil and olive trees samples were collected from three sites varied in their traffic density levels. Site (A) between km 45-47 on the major Alexandria-Cairo road was chosen and representing the high traffic density sample. The second location (B), olive trees farm located close to the first site, about 50-100 meters to the west of the major road. The third location (C), olive trees farm, Nubaria Horticulture Research Station, 17 km to the east of the first site and serve as the pollution free reference point being forfrom the traffic density. Roots, leaves and fruits were analyzed for heavy metals contents before and after washing in addition to soil samples to distinguish the effect of road deposits and dust precipitation on their content of these heavy metals. Analysies of samples were conducted at the Soil Salinity Lab. Agric. Research Center, Alexandria, using Atomic Absorption Spectrophotometry. The data showed high correlation between the analyzed elements Pb, Zn Cu and Fe in each season and traffic density especially in roots and leaves of olive trees. Lead was the highest element in the organs of the olive tree compared with the other elements. Its mean concentration was 27.42, 19.5, and 37 µg/g dry weights in roots, leaves and fruits, respectively. While Cd showed the lowest concentration and was not affected by traffic density, the micronutrients Zn, Cu, and Fe showed adequate concentration. Washing the samples of leaves and fruits showed significant effect on decreasing the concentration of Pb, Zn, Cu and Fe, being reduced by a percentage ranged from 1 to 41%, indicating the effect of environmental pollution on precipitation of such elements on the surface of leaves and fruits. Thus, we can conclud that washing is necessary for consuming such fruits before using to avoid hazards of toxicity. At the same time, concentration of these elements in the soil showed that they were low and did not reach the hazard level.

INTRODUCTION

Olive (Olea europea,L) is one of the most important and popular fruit crops in Egypt and its total acreage exceeded rapidly during the few last years, especially in the newly reclaimed lands . The total olive area in Egypt reached 118382 feddans and the total annual olive production reached 314450 tons (Agricultural statistics, 2005). Olive tree grows successfully under the prevailing conditions, where soil is poor and available water is limited. In addition, olive offers a great economic potential comparing with other fruits grown under the same conditions (El-Sharkawy, 1999).

During the last 2 decades olive was grown in the island between the two roads from Alexandria to Cairo. As olive an economic crop, it was suggested that the traffic may affect its production and its accumulation of heavy metals which may be hazardous to health of the consumers. Lagerwerrf and Specht (1970) reported that the concentration of Cd, Ni, Pb, and Zn in road side soil and grass samples from several locations decreased with the distance from vehicular traffic. Concentration was related to the composition of gasoline, motor oil, and automobile tires, and to roadside deposition of residues of these materials. Concentration from motor vehicle emissions within 100 m from the roadway has been reported in vegetation (Motto *et al.*, 1970; Ward *et al.*, 1975) soils (Yassoglou *et al.*., 1987) and spider webs (Hose *et al.*, 2002).

Diverse biochemical changes in green plants in response to heavy metals have been reported by several authors : decrease in chlorophyll content, carotenoids (Fargasova, 2001), proteins (Kevresan *et al.*., 2001), nitrate reductase activity (Singh *et al.*, 1997), lamina and mesophyll thickness, epidermal cell size and diameter of vessels (Kovacevic *et al.*, 1999), increase in chlorophyll a/b ratio (Fargasova, 2001) and concentration of phenols (Lummerzheim *et al.*., 1995; Lavid *et al.*, 2001). In the presence of other metals, such as Al, Cu and Cd, lipid peroxidation has been increased (Shah *et al.*, 2001).

The aim of this study is to compare between the concentration of some heavy metals in soils and olive trees grown in three sites varied in their traffic densities as indicator for local environmental pollution in the adjacent areas to major and minor roadsides. So we can determine to a great extent whether these heavy metals reached the toxic levels or not, besides presenting information relating to public health on heavy metals concentration in olive fruits to consumers.

MATERIALS AND METHODS

Samples and sample collection:

The desert road is one of the major roads in Egypt, connect between the two biggest cities Alexandria and Cairo road, hence, traffic density is high on the road. Site (A) between Km 45 and 47 on this road was chosen and representing the high traffic density samples. The second location (B), olive trees farm located close to the first site, about 50-100 meters to the west of the major road. The third location (C), olive trees farm, Nubaria Horticulture Research Station, 17 km to the east of the first site and serve as the pollution free reference point being away from the traffic density. These sampling sites designated as A, B, and C respectively, are locations of high, medium, and low traffic density. Five uniform Shemlaly olive trees about the same age (20 years old) were selected from each location. In August, at harvest time, samples of leaves, roots and fruits were taken from each tree in 2003and 2004 seasons.

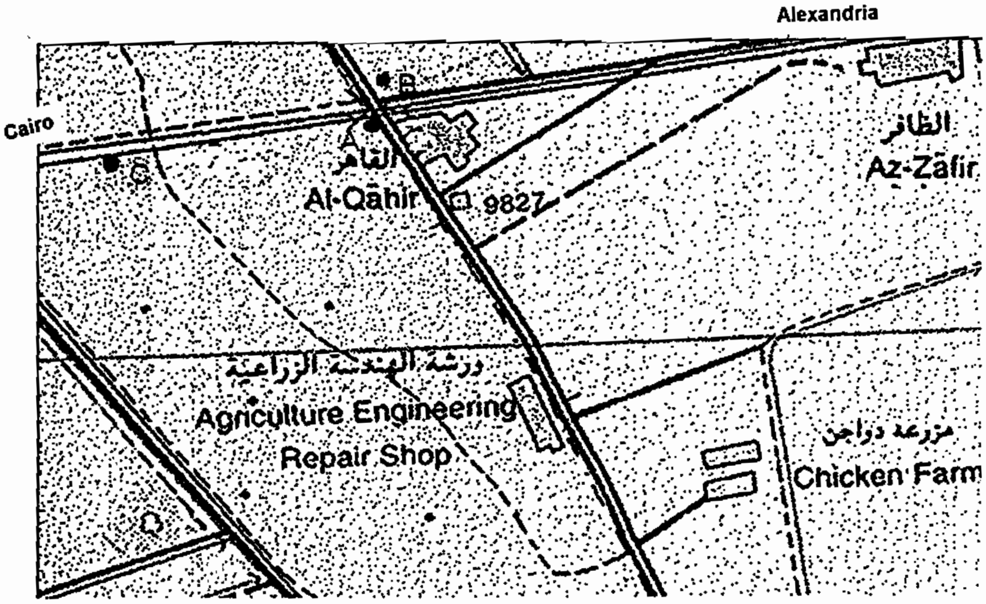
Plant Analysis:

Each sample of leaves and fruits was divided into two parts, the first part of leaves and fruits was washed with tap water and then with distilled water and the second one was left without washing. After that they were oven dried at 70°C to a constant weight, and ground to pass through 2-mm sieve. The ground plant material was digested according to Evenhuis and DeWaard (1980), and the concentration of Pb, Cd, Zn, Cu, and Fe were determined using Atomic Absorption Spectrophotometer (A.A.S.), Perkin Elmer 3300.

Soil analysis:

Surface soil samples (0-30 cm) (as indicated in the given map) from each location were taken, air dried and let to pass through 2-mm sieve. The soil samples were then extracted by using DTPA according to Soltanpour and

Schwab (1977) and determined for the same elements by A.A.S. Statistical analysis was conducted by using Costat Software (1985) and the data was tabulated.



A map for the sites of olive samples

RESULTS AND DISCUSSION

Heavy metals in roots:

The concentration of Cd, Pb, Zn, Cu and Fe in the root system of olive trees are presented in table 1 and Fig.1. It is clear that there was a marked variation of concentration of Cd, Pb, Zn, Cu and Fe in roots of olive tree depending on locations under study. Root samples from location (A) generally have higher values of Zn, Pb, Cu, and Fe compared with those of (B) and (C) locations.

Table (1): Levels of Cd, Pb, Zn, Cu and Fe of olive trees roots collected from three sites of different traffic denisty

Locations	Cd	Pb	Zn	Cu	Fe
First Season (µg/g dry weight)					
(A)	2.42	27.42	14.92	15.15	17.73
(B)	2.61	10.50	6.63	8.16	12.98
(C)	1.95	11.50	6.58	9.11	9.15
LSD (5%)	0.209*	11.17*	5.149*	5.127*	N.S
Second Season (µg/g dry weight)					
(A)	2.11	13.58	5.25	9.74	6.56
(B)	2.21	12.62	5.25	9.45	11.11
(C)	2.14	13.33	8.00	8.32	10.76
LSD (5%)	N.S	N.S	N.S	N.S	N.S

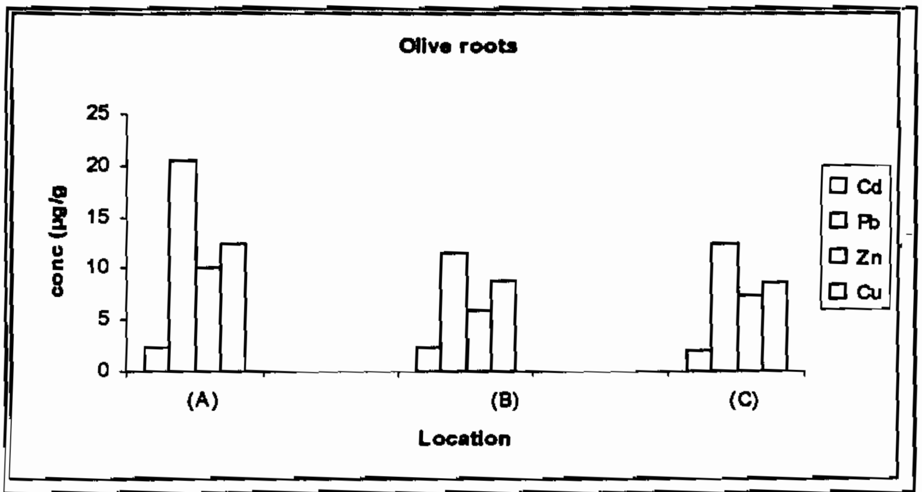


Fig. (1): Mean concentrations of two seasons of Cd, Pb, Zn and Cu as affected by distance from road in olive roots

The content of Cd showed the least concentration among the other measured elements. Brown *et al.*.(1998) reported that lettuce grown in soil-amended with the more contaminated biosolids was not different than that of the initial cropping. They concluded that hazards with food chain transfer of biosolids applied Cd was substantially lower and that the hazards did not increase over time. While Yang *et al.*.(1998) stated that tolerance to Cd differed between the crops, Angelova *et al.*.(1998), stated that contents of heavy metals varied greatly in the different plant parts, being greatest in the rachis and the skin, and lowest in the pulp. At the same time Pb showed the highest concentration among the other measured elements. The concentration of Pb in the first season reached 27.42 µg/g dry weight at location (A), then it decreased to 10.50 µg/g dry weight at location (C). The concentration of Pb of olive trees roots was not varied statistically in the second season. Once again, Pb in the roots of olive trees grown at the high traffic density location (A) was found to be the half (13.58 µg/g.d.w) in the second season compared with the first season (27.42 ug/g). This decrease in the second season may refer to decrease of the density of traffics on the road in time of sampling or may due to some other environmental factors (Shalaby, 2004). The same trend was noticed for Zn, Cu and Fe.

Heavy metals in leaves:

Table 2 referred to the statistical analysis for Cd, Pb, Zn, and Cu as affected by locations and washing by tap water. It was clear from table 3 and Fig.2, that Cd was not affected by washing the samples. Also, the Cd concentration did not differ between the sites in the first season of sampling, indicating that the local environment had no effect on its concentration. The Cd concentration averaged 2 ppm which means safety in use if it is used for any agricultural purpose, i.e. fermentation to be used in manufacturing. biofertilizers. Kawamata and Miykoda (1973), showed that no abnormality was found in shoot development of any studied fruit trees, chestnut, grape, peach and plum, with Cd. On the other hand, the concentration of Pb was high enough in the unwashed samples to advise not to be used in agricultural purposes. Its range in the unwashed samples was between 18.83 and 26.58 ppm. Washing the leaves decreased this concentration by about 18, 15 and 11% from its original concentration before washing for the three locations (A, B, and C, respectively) but still unsafe for use. The other elements, Zn, Cu and Fe were reduced also due to washing but to different extent. Iron showed the greatest effect for washing the samples where it reduced to 13, 35 and 47 % for the three locations, respectively. Zinc was reduced by 26, 21, and 1 %, while Cu reduced by 19, 9 and 41 % for the three sites, respectively. The high concentration of the measured elements in the samples of the high traffic density road (A) comparing with the other two sites indicated the effect of the local environment pollution. The main environmental factor here was the pollution resulting from the road, i.e., the dust, the exhaust of cars and little returned to the human effect. Fig 2 declared this data, where Pb had the higher concentration comparing with the other elements. El-Gazzar *et al.*. (1987) related such finding to the physical properties of the leaf surfaces. They stated also that for most nutrients, there were no significant differences between non dusted orange leaves and those dusted and washed with acid detergent or distilled water.

Heavy metals in fruits:

The data in Table 4 and Fig 3 referred to the concentration of elements in olive fruits. The data clarify that both of cadmium and lead had the greatest concentration among the other two parts (roots and leaves). This may be due to its translocation from roots and deposition from the wind carrying pollutants. Cadmium concentration in the location (A) was not comparatively higher than the other two sites (B and C). Also, washing was not effective in removing the element where it only removed a range between 2 and 12% of the element. Lead also had the same trend where washing removed between 3 and 10% of the element. The data showed that there was no significant difference between the two seasons indicating that the difference is due to environmental factors rather than treatments.

Table 2. Statistical significance for Cd, Pb, Zn, and Cu as affected by locations and washing.

Treatment	Cd	Pb	Zn	Cu	Cd	Pb	Zn	Cu
	Element				Element			
	Leaves				Fruits			
	1st season				*1st season*			
Location	0.48*	NS	NS	3.2**	NS	1.87**	2.03*	NS
Washing	NS	NS	1.07**	NS	NS	1.53**	1.65**	1.88**
	2nd season				*2nd season*			
Location	NS	NS	0.97**	0.79**	NS	NS	1.42*	2.12*
Washing	0.08**	NS	0.92**	0.76**	NS	NS	1.61**	1.73*

*, **, and NS indicate significant at 0.05 and 0.01 level of probability, and not significat, respectively.

Numbers indicate to Least significant Difference (LSD) at 0.05 probability level.

Table (3): Elemental analysis of washed and unwashed olive leaves collected from three sites of different traffic denisty

Location	Washed Samples					Unwashed Samples		
	Cd	Pb	Zn	Cu	Fe	Cd	Cu	Fe
	First Season (µg/g dry weight)							
(A)	2.18	20.08	7.67	11.98	387.83	2.40	13.07	480.42
(B)	2.22	18.50	6.75	7.31	489.92	2.56	6.49	786.83
(C)	1.72	16.75	6.33	4.41	306.17	2.22	9.04	622.50
	Second Season (µg/g dry weight)							
(A)	2.20	18.65	7.25	7.55	455.33	2.42	11.11	491.33
(B)	2.31	16.33	6.41	5.75	322.67	2.38	7.88	478.25
(C)	2.21	15.91	6.75	5.48	251.17	2.46	7.90	439.92

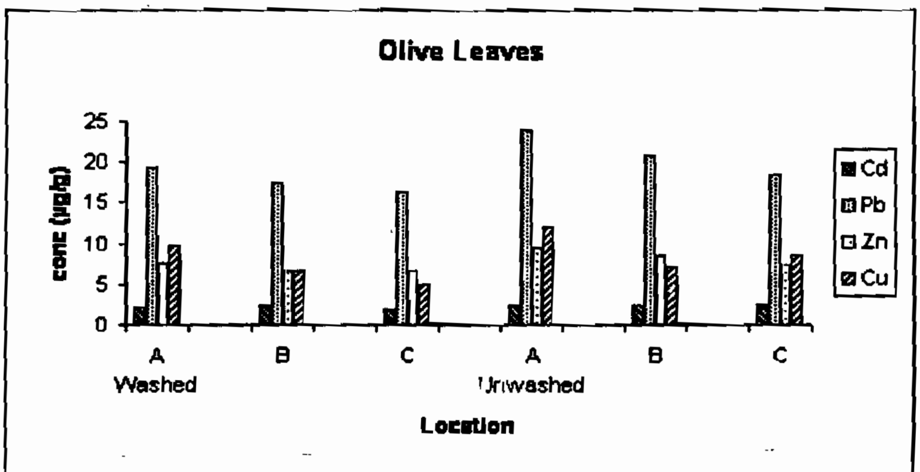


Fig. (2): Mean concentrations of two seasons of Cd, Pb, Zn and Cu in washed and unwashed leaves as affected by distance from road

Table (4): Elemental analysis of washed and unwashed olive fruits collected from three sites of different traffic denisty

Location	Washed Samples					Unwashed Samples				
	Cd	Pb	Zn	Cu	Fe	Cd	Pb	Zn	Cu	Fe
	First Season (µg/g dry weight)									
(A)	5.33	37.00	5.25	6.93	100.50	5.75	37.00	12.00	10.50	116.25
(B)	5.58	32.25	6.25	5.80	92.00	5.50	37.00	8.50	9.75	96.25
(C)	5.05	31.00	4.50	5.18	97.00	5.45	37.50	5.95	9.50	79.50
	Second Season (µg/g dry weight)									
(A)	5.23	37.25	7.25	6.63	106.25	5.30	40.50	8.28	11.75	109.00
(B)	5.15	37.75	4.95	5.50	141.50	5.50	37.50	7.50	8.25	117.75
(C)	4.48	36.00	4.38	5.50	120.50	5.30	37.50	7.50	7.50	75.50

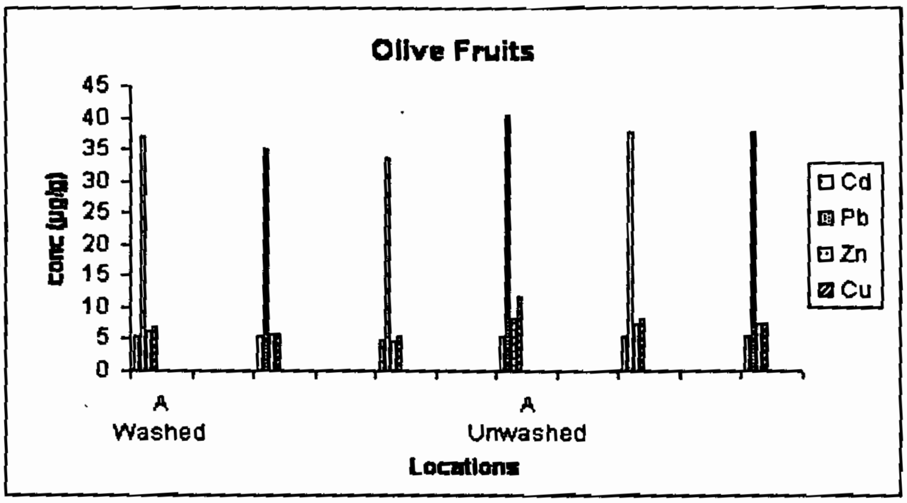


Fig. (3): Mean concentrations of two seasons of Cd, Pb, Zn and Cu in washed and unwashed fruits as affected by distance from road

Zinc differed from Cd and Pb in that washing removed higher amounts ranged between 14 and 74% indicating that the environment had the greatest effect in raising its concentration and that washing may be a good treatment in using such fruits for human use without any side effect. Copper was also a washable element from olive fruits, where its concentration decreased from 32 to 52% of the element. Iron showed higher concentration in the high traffic density road than the other two sites and an amount ranged between 9 and 40% was washed.

In general, it was noticed that the concentration of measured elements did not reach the toxic levels except lead which showed some rise in its concentration. This may be due to that the surface of leaves and fruits were smooth waxy which did not permit the accumulation of dust deposits on its surface. Debrova *et al.*.(1974) found similar results when working on orange fruits and leaves. Edmond *et al.*.(1981) mentioned that leaf–dust deposits reduced the rate of photosynthetic activity. El-Gazzar *et al.*.(1987) reported that dusting the leaves of orange, guava and grapes increased most of the nutrient contents. Haggag and El-Kobia (1989) found that Cd and Pb was more concentrated in leaves of orange trees adjacent to the motorway than those at distant from the road, while Mn and Cu showed inconsistent trend.

Heavy metals in Soils:

Table (5) shows the soil chemical analysis for the investigated elements. It was clear from the data that Cd content was low in the three sites of sampling compared with the other elements indicating that Cd had a minor effect on local environment due to traffic density. This conclusion leads us to discard Cd when discussing the result of heavy metal coming from motor vehicles on traffic roads. On the contrary, Pb, which reached to about 7 µg/g soil in the sample of location (A), seemed to have some hazardous effects especially in case of accumulation in the soil. Its concentration in roots, leaves and fruits of olive trees reached about 37 µg/g dry weights, which may lead to hazardous health consequences to traffic warder, livestock, street marketer and olive fruit consumers.

Regarding to the other three elements (Zn, Cu and Fe), they were of low concentration in the soil samples especially, they are considered micronutrients and the plants are in need to them. Heavy metals accumulation in soil implies many environmental factors which affect the deposition, content, and distribution of elements. Shalaby (2004) stated that heavy metals are dispersed with the aerosol in the ambient air and transported by wind then deposited into the surrounding environment depending on the direction of wind. The results of this study indicate also that the data from the meteorological reports are important for studying metals deposition due to traffic density.

Table (5): DTPA- extractable elements of soil samples collected from three different sites of different traffic denisty

Location	Cd	Pb	Zn	Cu	Fe
			First Season (µg/g soil)		
(A)	0.05	7.00	1.30	2.26	16.12
(B)	0.02	4.00	0.16	1.24	1.60
(C)	0.04	5.25	0.82	2.22	14.08
LSD (5%)	0.209*	11.7*	5.149*	5.127*	N.S.
			Second Season (µg/g soil)		
(A)	0.70	6.20	0.96	2.10	16.00
(B)	0.02	4.25	0.14	1.20	1.80
(C)	0.04	5.15	0.90	2.50	13.60
LSD (5%)	N.S.	N.S.	N.S.	N.S.	N.S.

CONCLUSION

The data indicated that Cd, either from the effect of motor vehicles or from human activities, was not of significance effect on the three parts of the trees. When taking in consideration the concentration of Pb, we must be care especially for fruits when it is used by consumers. For Zn, Cu and Fe, they were found to in adequate concentration and may be consumed safely after washing.

We may concluded also that environmental pollution data trend to vary extensively and subjected to various types of uncertainties due to several factors such as the distance from pollution source and pathways, natural background variation, pollution buildup or degradation over time.

REFERENCES

Agricultural Statistics (2005). A.R.E. Ministry of Agric. and Land Reclamation. Economic Affairs Sector, Vol. 2, June.

Angelova, V., A. Ivanov, and D. Braikov, (1998). Distribution of heavy metals in grapes of some desert varieties grown in an industrially polluted regions. in (Hort. Abst. 1999 Vol. 69 No 4.)

Brown, S.L., R.L. Chaney, J.S. Angle and J. A. Ryan (1998). The phytoavailability of cadmium to lettuce in long-term biosolids-amended soils. Journal of Environ. Qual. 27(5): 1071- 1078.

Costat. Cohart Software. Version 3.0 Users Manual, Tucson, Arizona, (1985).

Debrova, S., T. Slavcheva, and K. Stoev (1974). Pollution by cement dust and grape vine photosynthesis.Gradinarska Lozarska Nauka 11 (8): 91-97 (Hort. Abst. 45:8264).

Edmond, J.B., T. L. Senn, and F.S. Andrew (1964). Fundamentals of horticulture. 3rd ed. McGraw Hill. Book Company, New York, USA.

Evenhuis, B. and P.W. DeWaard (1980). Principals and practices in plant analysis.

FAO Soils Bull. 38(1): 152- 163.

El-Gazzar, A.M., M.W. Taha, H.A. El-Shamy and W.A. El-Sisy.(1987). Effect of dust contamination and sample cleaning procedure on leaf chemical composition of oranges, guavas and grapes. Alex. J. Agric. Res. 32 (3): 231- 242.

El-Sharkawy. M.S. (1999). Physiological studies on flowering and fruiting of olive trees. pp.1-3.Ph.D. Fac. Agric. Moshtohor, Zagazig Univ. Egypt.

Fargasova, A. (2001).Phytotoxic effect of Cd, Zn, Pb, Cu and Fe on *Sinapis alba* L. seedlings and their accumulation in roots and shoots. Biol. Plant. 44: 471- 473.

Haggag, M.N. and A. M. El-Kobia. (1989). Effect of heavy metal pollution on leaf composition, fruit set and fruit quality of Washington navel orange. Alex. J. Agric. Res. 34 (1): 113- 122.

Hose, G. C., J. M. James and M.R. Gary (2002). Spider webs as environmental indicators. Environ. Pollut. 120:725-733.

Kawamata, S. and H. Miyakoda. (1973). Cdmium absorption by fruit trees.

Agriculture and Horticulture, 48 (4): 95- 96 (Hort. Abst. Vol. 45, 4619).

Keversan, S., N. Petrovic, M. Popovic, and J. Kandrac . (2001). Nitrogen and protein metabolism in young pea plants as affected by different concentrations of nickel, cadmium, lead, and molybdenum. J. Plant Nutr. 24: 1633- 1644.

Kovacevic, G., R. Kastori and L.J. Merkulov (1999). Dry matter and leaf structure in young wheat plants as affected by cadmium, lead, and nickel. Biol. Plant. 42: 119- 123.

Lagerwerff, J.V. and A.M. Specht (1970). Contamination of roadside soil and vegetation with cadmium, nickel, lead, and zinc. Environ. Sci. Technol. 4: 583-586.

Lavid, N., A. Schwartz, O. Yarden, and E.Tel-Or. (2001). The involvement of polyphenoles and peroxidase activities in heavy-metal accumulation by epidermal glands of waterlily (Nymphaeceae) Planta. 212: 323- 331

Lummerzheim, M., M., C. Sandroni, D. Castresana, M. De Oliviera, van Montagu, D. Roby, and B. Timmerman (1995). Comparative microscopic and enzymatic characterization of the leaf necrosis induced in *Arabidopsis thaliana* by lead nitrate and by *Xanthomonas campestris* pv. *campestris* after foliar spray. Plant Cell Environ.. 18: 499- 509.

Motto, H.L., R.H. Daines, D.M. Chilko, and C. K. Motto (1970). Lead in soils and plants: its relationship to traffic volume and proximity to highways. Environ. Sci. Tecknol. 4: 231- 237.

Shah, K., R.G. Kumar; S. Verma and R. S. Dubey. (2001). Effect of cadmium on lipid peroxidation, superoxide anion generation and activities of antioxidant enzymes in growing rice seedlings. Plant Sci. 161: 1135-1144.

Shalaby E. A. (2004). A study of heavy metals dispersion and deposition around two municipal soils waste (MSW) dumpsites onto soils and vegetation, in Alexandria, Egypt. Alex. Sci. Exch., Vol 25 No. 4, pp. 717-733.

Singh, R.P., S. Dabas, Choudhary, and R. Maheshwary. (1998). Effect of lead on nitrate reductase activity and alleviation of lead toxicity by inorganic salts and 6-benzyla-minopurine. Biol. Plant. 40: 399- 404.

Soltanpour, P.N. and A. P. Schwab (1977). A new soil test for simultaneous extraction of macro- and micro nutrients in alkaline soils. Comm. Soil Sci. Plant Anal., 8 (3): 195- 207.

Ward, N.I., R. D. Reeves and R. R. Brooks (1975). Lead in soil and vegetation along a New Zealand state highway with low traffic volume. Environ. Pollut. 9: 243- 351.

Yang, M., L. X. Yong and X. Yang. (1998). Impact of Cd on growth and nutrient accumulation of different plant species. Chinese J. of applied Ecology, 9 (1): 89- 94.

Yassoglou, N., C. Kosmas, J. Asimakopolus and C. Kallianou. (1987). Heavy metal contamination of roadside soils in greater Athens area. Environ. Pollut. 47: 293- 304.

تركيز بعض العناصر الثقيلة فى الأراضى وأشجار الزيتون كدالة للتلوث البيئى الناتج من الطرق السريعه فى مصر

محمد عامر عمر* وعفاف محمد يوسف**

*** معهد بحوث الأراضى والمياه والبيئة - مركز البحوث الزراعية**

**** معهد بحوث البساتين - مركز البحوث الزراعية**

جمعت عينات من التربة وأشجار الزيتون من ثلاث مواقع مختلفة فى كثافتها المرورية كانت الأولى (أ) من الجزيرة الواقعة على الطريق الصحراوى بين القاهرة و الأسكندرية بين الكيلو ٤٥ و ٤٧ و تمثل أعلى العينات فى الكثافة المرورية والثانية (ب) من مزرعة تبعد من ٥٠ – ١٠٠ متر من الطريق الصحراوى والثالثة (ج) من مزرعة زيتون محطة بحوث بساتين النوبارية و تبعد ١٧ كم الى الشرق من الموقع الأول و تعمل كموقع خالى من التلوث الناتج من المرور وتم تحليل العينات قبل وبعد الغسيل لدراسة محتواها من العناصر الثقيلة لتحديد أثر الترسيبات والأتربة من الطريق على محتواها من هذه العناصر.

أجريت التحاليل فى معمل بحوث الاراضى (مركز البحوث الزراعية) باستخدام جهاز الأمتصاص الذرى وقد أظهرت النتائج ارتباطا معنويا بين الرصاص والزنك والنحاس والحديد فى الأشجار فى كل موسم وبين الكثافة المرورية خاصة فى الجذور والأوراق ولم تكن هناك اختلافات معنوية بين الموسمين وكان الرصاص أكثر العناصر تركيزا فى أجزاء الشجرة المختلفة وبلغ متوسط التركيز ٢٧,٤٢ ، ١٩,٥ ، ٣٧ ميكروجرام / جرام مادة جافة فى الجذور والأوراق والثمار على التوالى وبينما كان الكادميوم أقل العناصر تركيزا وأقلها تأثرا بالكثافة المرورية فقد أظهرت العناصر الصغرى الزنك والنحاس والحديد تركيزات متوازنة وأظهر غسيل عينات الأوراق والثمار تأثيرا معنويا فى خفض تركيز الرصاص والزنك والحديد حيث انخفض تركيزها بمتوسط تراوح بين ١، ٤١% مشيرا الى تأثير تلوث البيئة على ترسيب مثل هذه العناصر على سطوح الأوراق والثمار وبالتالى يمكن القول بأن عملية الغسيل لابد منها قبل استهلاك مثل هذه الثمار لتلافى الأثر الضار لها وفى نفس الوقت فان تركيز هذه العناصر فى الأرض لم يصل الى حد السمية وان تركيز العناصر الصغرى بالأرض كان قليلا لاحداث ضرر للاشجار النامية.