HIGHWAYS AS A SOURCES OF POLLUTION WITH HEAVY METALS AND ITS EFFECT ON ADJACENT SOIL AND PLANTS IN NILE DELTA OF EGYPT

Abou El-Khir A M; A. A. Balba; M.S. Shams and Manal F.Tantawy
Soil Sci.Dept. Fac.of Agric., Kafr El-Sheikh, Tanta Univ. Egypt

ABSTRACT

Two sites located in Nile Delta were selected to study the effect of traffic intensity (exhaust gases) on levels of some heavy metals such as Cd,Ni, Co and Pb in soil as well as plant parts. The first area tested at Tanta (Alex. – Cairo highway) and the second, in Meet Khalaf (Shibin El-Kom-Cairo road). Surface (0–15 cm) and subsurface (15–30 cm) soil samples were collected at the distances of 50,250, 500 and 1000 m away from traffic line during spring 2003.

Results showed that total and available Cd, Ni, Co and Pb contents (mg/kg) in the surface and subsurface soil samples decreased along the distance away from the highways, particularly in the surface samples. Total concentrations of heavy metals were arranged in the following order: Pb (150.70- 22.88)> Co (50.40 – 10.50) > Ni (50.47 – 9.15)> Cd (5.68 - 1.20) mg / kg. But the available forms of heavy metals were arranged in the following order: Pb (15.25 – 1.25) > Ni (0.75 – 0.20)> Co (0.35 – 0.07) > Cd (0.05 -0.01) mg/kg. Content of total and available Cd, Ni and Co were lower than that the permissible limits in studied locations. While the content of total and available Pb were more than that the permissible level.

Both heavy metals contents and bioconcentration ratio (BCR) varied widely according to distance from pollution source, plant species and plant part of the ordinary Egyptian growers. The contents of Cd, Co, Pb and Ni in the collected plants were decreased with increasing the distance from highways for the same plant species. The content of Cd,Co and Pb in plants under study in Tanta site {intensive traffic} was higher than that in Meet Khalaf site whereas this trend was adverse for Ni. Lead, Cd, Co and Ni in the shoots of cotton was higher than that in their roots, whereas this trend was contrast for corn. Therefore edible plants should be cultivated for away from the traffic way.

Keywords: Heavy metals, pollution, contamination, highway and traffic.

INTRODUCTION

Sources of metals in the environment originate from both natural geological processes and human activities. Natural sources include excessive weathering of mineral and metal ions from rocks, displacement of certain concentrations from groundwater or subsurface layers of soil, atmospheric deposition from volcanic activity, and transport of continental dusts (Ernst, 1996 and Nofal, 1981). The most common human routes leading to the introduction of heavy metals into the environment are disposal of industrial effluents, application of sewage sludge, deposition of air-borne industrial wastes, military operations, mining, landfill operations, disposal of industrial solids and liquid wastes, use of agricultural chemicals (commercial fertilizers and pesticides), gas exhausts, and energy and fuel production. Major among such sources are agrochemicals (fertilizers and pesticides), municipal wastewater (sewage) and atmospheric fall-out (Nriagu, 1991 and Alloway, 1995). Heavy metals leaching, toxicity and uptake by organisms depends on soil chemical and physical properties as well as physiological properties of organisms present in, or-growing on the soil. The extractability and mobility of heavy metals in contaminated soils depends not only on the total concentration in soils but also on the metal speciation in the soil solution (Holmgren *et al.*, 1993 and Ensley, 2000).

The aim of present study is to monitor some heavy metals levels (Cd, Ni, Co and Pb) in soils as well as the cultivated crops by Egyptian growers in two regions, around highways in Gharbiya and Minufiya Governorates.

MATERIALS AND METHODS

Two locations in Nile Delta of Egypt were selected to study the effect of traffic (exhaust gases) on soil and plants pollution with some heavy m etals such as Cd, Ni, Co and Pb. The first site is located at Tanta (Alex. – Cairo highway, intensive traffic) Gharbiya Governorate and the second one in Meet Khalaf (Shibin El-Kom-Cairo road moderate traffic) Minufiya Governorates. Surface (0–15 cm) and subsurface (15–30 c m) s oil s amples w ere c ollected a t t he d istances o f 50,250, 500 and 1000 m from the highway during spring 2003. The soil samples were air-dried ground with porcelain mortar, passed through 2 mm nylon sieve and mixed thoroughly for laboratory analyses. pH, EC_e, soluble cations, organic matter (OM) content and cation exchange capacity (CEC, using NaOAc of pH 8.2) were determined according to Rhoades (1982) and Cottenie *et al.*, (1982). Some characteristics of soils are presented in Table (1).

Total content of heavy metals (Cd, Ni, Co and Pb) were extracted using Aqua Regia solution as described by Cottenie et al. (1982), the available forms were extracted using dithionite triamine penta acetic acid (DTPA), calcium chloride ($CaCl_2$) and triethanol amine as reported by Lindsay and Norvell (1978). Both total and available contents of heavy metals were measured using Perkin Elmer atomic absorption spectrophotometer model 2830.

Table (1): Some soils characteristics.

DH	Soil depth (cm)	pH†	EC_e* dSm^{-1}	SAR	Soluble Cations (mM)				OM %	CEC cmol/kg
					Na^+	K^+	Ca^{2+}	Mg^{2+}		
Tanta Site										
50	0-15	7.85	0.29	1.7	1.33	0.35	0.37	0.25	2.05	38.5
	15-30	7.88	0.31	1.8	1.45	0.35	0.39	0.26	1.95	37.1
250	0-15	7.74	0.34	1.9	1.50	0.60	0.41	0.25	2.05	38.5
	15-30	7.86	0.41	1.9	1.78	0.63	0.40	0.45	1.92	37.0
500	0-15	7.76	0.39	2.0	1.75	0.63	0.43	0.34	2.00	38.4
	15-30	7.76	0.43	2.1	1.90	0.70	0.43	0.43	1.90	37.0
1000	0-15	7.68	0.65	2.2	2.65	1.05	0.73	0.68	2.02	38.2
	15.30	7.73	0.63	2.3	2.65	1.00	0.70	0.63	1.90	36.9
Meet Khalaf Site										
50	0-15	7.63	0.62	2.3	2.80	0.56	0.68	0.75	2.10	35.4
	15-30	7.79	0.58	2.0	2.42	0.50	0.63	0.82	2.03	33.2
250	0-15	8.08	0.58	2.2	2.60	0.45	0.65	0.73	2.10	35.4
	15-30	8.09	0.57	2.1	2.40	0.45	0.60	0.83	2.00	33.2
500	0-15	7.95	0.58	2.2	2.60	0.50	0.70	0.65	2.15	35.3
	15-30	8.10	0.57	2.2	2.50	0.50	0.65	0.70	2.03	33.2
1000	0-15	7.97	0.60	2.5	2.85	0.61	0.68	0.60	2.09	35.2
	15-30	8.05	0.56	2.3	2.60	0.53	0.68	0.56	2.02	33.1

DH = Distance from highway, † = pH in 1:2.5 soil water suspension.
*** = Soil paste extract.**

Plant samples were collected from crops that already have been cultivated by growers from each field sites under investigation on May 2003, at the previous defined distances. The plant samples of cotton, corn were taken as a whole intact plant and the leaves of citrus trees only were collected. Plant samples were carefully washed thoroughly by dropping the plant in 10^{-4} N HCl solution and then dipped in a successive containers filled with redistilled water, Then, divided into shoots and roots, air-dried and then dried at 70 °C in oven, milled and digested by wet ashing according to Chapman and Pratt (1961). Heavy metals content were measured using Perkin Elmer atomic absorption, spectrophotometer model 2830. The bioconcentration ratio (BCR) was calculated by the following equation according to Blum (1997).

BCR = Element in plant (µg/g dry weight) / Element in soil as available, (mg / Kg soil).

RESULTS AND DISCUSSION

1. General soil characteristics:

Data in Table (1) show that the values of EC_e ranged between 0.29 and 0.65 dSm^{-1} where SAR were varied from 1.7 to 2.5 in all studied samples. According to James *et al.* (1982), the studied samples from Tanta and Meet Khalaf are normal soils where EC_e value are lower than 4 dSm^{-1} and SAR values are less than 13. Regarding the distribution of soluble cations, Na^+ was the dominant cation followed by Ca^{++}, Mg^{++} and K^+ or Mg^{++}, Ca^{++} and K^+ in all of the studied sites, (Table 1). Generally, pH values ranged between 7.63 and 8.09. The soil organic matter content (OM) in the studied soil samples was relatively low and ranged between 1.90 to 2.15 % . Generally, OM decreased with depth. The relatively high values of OM at the surface layers were expected due to regular and continuous cultivation and addition of farmyard manure and plant residues. The value of CEC ranged from 37.0 to 38.5 cmol /Kg for Tanta site and from 33.1 to 35.4 cmol /Kg for Meet Khalaf site.

2. Impact of pollution from highways on heavy metals content in the tested soils.

Data in Table (2) show the total and available contents of Cd,Ni,Co and Pb as mg/kg in surface (0-15 cm) and subsurface (15-30 cm) soil layers around the highways in the tested soils. Total and available Cd,Ni,Co and Pb contents decreased with increasing the distance from highways. The surface layers had higher total and available Cd,Ni,Co and Pb than those the subsurface layers. Accumulation of Pb in the soil surface is of great ecological significance because this metal was known to be greatly affected the biological activity in the soils (Alloway,1995). The enrichment of heavy metals in soil surface may be due to the pollution from exhaust traffic gases, cycling through vegetation, atmospheric deposition and adsorption by the organic matter. The total content of Cd, Co and Pb in the studied soil samples was higher in Tanta site than that in Meet Khalaf site, while Ni content gave the opposite trend. Shaban (1998) found similar results.

The obtained data in Table (2) also show that, the total content of Cd ranged between 5.68 mg/kg (in the surface layer at 50 m from highway in Tanta location) and 1.20 mg/kg (in the subsurface layer at 1000 m from highway in Meet Khalaf location). Whereas the available Cd ranged between 0.05 and 0.01 mg/kg in soils under study in the same locations. The amounts of total Cd are relatively lower than the maximum-recorded concentrations by Alloway (1995), who stated that the maximum total concentration of Cd was 41 mg/kg. In general, comparing the obtained results with those reported by El-Sokkary and Lag (1980), who found that the uncontaminated Egyptian soil have total Cd content of about 2 mg/kg and DTPA-Cd extractable was about 0.01 mg/kg, indicates that soil samples under consideration are considered light contaminated. On other study, Aboulroos *et al.* (1996) reported that the normal values of available Cd in cultivated alluvial soils of Egypt was 0.03-0.06 mg/kg with an average of 0.043 mg/kg.

Table (2): Total and available content of heavy metals (mg/kg) in the soils around the highways.

DS	Soil depth (cm)	Tanta Site				Meet Khalaf Site			
		Av.	Total	Av.	Total	Av.	Total	Av.	Total
		Cd		Co		Cd		Co	
50	0-15	0.05	5.68	0.35	50.40	0.05	5.15	0.28	40.12
	15-30	0.03	2.05	0.15	17.40	0.03	2.17	0.13	15.30
250	0-15	0.05	5.60	0.32	48.17	0.04	4.50	0.28	38.50
	15-30	0.03	2.00	0.13	16.50	0.02	1.65	0.11	13.50
500	0-15	0.04	4.82	0.27	45.05	0.02	3.22	0.25	33.40
	15-30	0.02	1.75	0.10	13.15	0.01	1.50	0.10	11.25
1000	0-15	0.03	4.15	0.24	37.50	0.02	3.00	0.23	32.05
	15-30	0.01	1.36	0.10	11.60	0.01	1.20	0.07	10.50
		Ni		Pb		Ni		Pb	
50	0-15	0.73	45.45	15.25	150.70	0.75	50.47	10.40	120.15
	15-30	0.31	10.15	5.14	50.50	0.25	12.28	2.21	40.18
250	0-15	0.73	43.11	13.22	143.65	0.70	49.50	9.85	115.40
	15-30	0.28	10.05	3.82	45.30	0.25	11.85	1.60	35.70
500	0-15	0.65	42.50	12.50	130.50	0.67	47.50	7.50	102.40
	15-30	0.26	9.50	3.05	30.17	0.23	11.85	1.25	25.70
1000	0-15	0.62	42.50	10.85	125.17	0.60	46.15	6.11	90.34
	15-30	0.26	9.15	1.75	28.40	0.20	11.15	1.25	22.88

DH = Distance from highway, Av. = Available

The data in Table (2) show that, the total content of Ni ranged from 50.47and 12.28 mg/kg (at 50 m from highway of Meet Khalaf location) to 42.50 and 9.15 mg/kg (at 1000 m from highaway of Tanta location) in the surface and subsurface layers respectively. Generally, total Ni in all studied samples were lower than the natural concentration (100 mg/kg as reported by Kabata-Pendias and Pendias, 1992). The normal content of available Ni in alluvial soils of Nile Delta ranged between 0.30 and 1.02 mg/kg with an average of 0.64 mg/kg (Aboulroos *et al.*, 1996). Concerning the investigated soils, the highest and lowest values of available Ni (0.75 and 0.20 mg/kg) were observed in the surface layers at 50 m and subsurface layer at 1000 from highway of Meet Khalaf location. These results are in harmony with those found by Shaban (1998).

The results in Table (2) show that, the total content of Co ranged between 50.40 and 17.40 mg/kg (at 50 m from highway of Tanta location) to 32.05 and 10.50 mg/kg (at 1000 m from highway of Meet Khalaf location) for surface and subsurface layers, respectively. In addition, the available Co was ranged from 0.35 and 0.15 to 0.23 and 0.07 mg/kg at the same locations for surface and subsurface layers, respectively. The natural concentration of total Co in soil, according to Kabata-Pendias and Pendias (1992) ranged from 25 to 50 mg/kg. On the other hand, Gray (1992) reported that the total Co in normal level was ranged from 1 to 70 mg/kg. While Aboulroos *et al.* (1996) reported that the available Co in normal alluvial soils of Nile Delta was ranged between 0.13 to 0.28 mg/kg with an average of 0.19 mg/kg.

The results in Table (2) show that, the total content of Pb ranged between (150.70 and 50.50 mg/kg (at 50 m from highways of Tanta region) to 90.34 and 22.88 mg/kg (at 1000 m from highway of Meet Khalaf region) in surface and subsurface layers, respectively. The amount of total Pb is higher than natural content. While the natural content of total Pb in soil was 100 mg /kg (Mengel and Kirkby (1987). The normal content of available Pb in Egyptian alluvial soils of Nile Delta was reported to be 0.78-2.46 mg / kg with an average of 1.39 mg/kg (Aboulroos *et al.* 1996). Concerning the investigated soils, the available Pb was ranged from 15.25 and 5.14 mg/kg (at 50 m from highway of Tanta region) to 6.11 and 1.25 mg/kg (at 1000 m from highway of Meet Khalaf region) for surface and subsurface layers, respectively. Such data revealed that levels of some heavy metals have been increased in surface soils closed to highways. Such increase has the ability to be sustainable and may cause a contentious and gradual increase concentration of such elements especially, the surface soil.

3. Impact of pollution from highways on heavy metals content in the tested plants

Heavy metals content (mg/kg) and its bioconcentration ratio (BCR) in both shoots and roots of the plants in the tested sites of Gharbiya and Minuftya Governorates as affected by highways, were recorded in Table (3). Both Heavy metals contents and BCR varied widely according to 1) distance from pollution source, 2) plant species and 3) plant part.

Data in Table (3) show that the Cd content ranged from 3.22 mg/Kg in cotton roots at Meet Khalaf region to 30.47 mg/Kg in citrus leaves at Tanta region. Also, the highest values of Ni content were recorded in the plants cultivated in Tanta whereas the lowest were found in the plants cultivated in Meet Khalaf. The Ni content in shoots and roots of cotton cultivated at 500 m from highways in Tanta region were 67.30 and 50.15 mg /kg, while in Meet Khalaf region were 8.88 and 8.21 mg / kg respectively, corresponding BCR values in the same previous sites were 147.19, 110.22, 19.73 and 18.24 respectively. On the other hand, Ni, Cd and Co contents in shoots of cotton were higher than roots, whereas the roots of corn plant contained higher Ni than those of shoots. This distribution may be attributed to the translocation rate of Ni from roots to shoots (Alloway, 1995 and Abdel Sabour *et al.,* 1995).

Table (3): Heavy metal concentrations (mg/kg) and its bioconcentration ratio (BCR) in the plants (part) cultivated in the soils around highway.

DS	Tanta Site				Meet Khalaf Site			
	Parameter							
	Plant species	Plant part	Conc. (mg/kg)	BCR	Plant species	Plant part	Conc. (mg/kg)	BCR
				Cd				
50	-	-	-	-	Cotton	Shoots	4.48	112.0
	-	-	-	-		Roots	4.25	106.3
250	Corn	Shoots	4.65	116.3	Cotton	Shoots	4.50	150.0
		Roots	6.11	152.8		Roots	3.90	130.0
500	Cotton	Shoots	5.61	187.0	Cotton	Shoots	4.50	300.0
		Roots	4.44	148.0		Roots	3.22	214.7
1000	Citrus	Leaves	30.47	1523.5	Corn	Shoots	4.11	274.0
	-	-	-	-		Roots	5.22	348.0
				Ni				
50	-	-	-	-	Cotton	Shoots	20.70	41.40
	-	-	-	-		Roots	18.50	37.00
250	Corn	Shoots	38.15	75.54	Cotton	Shoots	16.15	34.00
		Roots	42.50	84.16		Roots	11.33	23.86
500	Cotton	Shoots	67.30	147.19	Cotton	Shoots	8.88	19.73
		Roots	50.15	110.22		Roots	8.21	18.24
1000	Citrus	Leaves	128.40	291.81	Corn	Shoots	36.50	91.25
	-	-	-	-		Roots	40.55	101.38
				Co				
250	Corn	Shoots	40.15	178.4	Cotton	Shoots	60.13	308.4
		Roots	43.70	194.2		Roots	50.25	257.7
500	Cotton	Shoots	48.22	260.6	Cotton	Shoots	55.65	318.0
		Roots	45.50	245.9		Roots	50.25	287.1
1000	Citrus	Leaves	122.70	721.8	Corn	Shoots	30.40	202.7
	-	-	-	-		Roots	36.19	241.3
				Pb				
50	-	-	-	-	Cotton	Shoots	1720.13	272.8
	-	-	-	-		Roots	1340.20	670.1
250	Corn	Shoots	2820.45	331.0	Cotton	Shoots	1630.20	284.8
		Roots	3415.34	400.9		Roots	1300.00	227.1
500	Cotton	Shoots	4650.30	598.1	Cotton	Shoots	1405.20	321.2
		Roots	4000.45	514.5		Roots	1000.17	228.6
1000	Citrus	Leaves	3820.35	606.4	Corn	Shoots	2000.20	543.5
	-	-	-	-		Roots	2480.17	674.0

-The samples is not taken, DS = Distance from pollution source.
Toxic limits in plant according to Kabata Pendias and Pendias (1992): Cd (5-30 mg/Kg), Ni (10-100 mg/Kg), Co (1-32 mg/Kg) and Pb (30-300 mg/Kg).

Cobalt concentration in all tested plants, which collected from studied soils have exceeded the maximum limits concentration, recorded in contaminated plants by Kabata Pendias and Pendias (1992). Except corn at 1000 m from highway in Meet Khalaf. Tantawy, Manal (1996) found a good and significant relationship between Co content in barley and fenugreek plants and its available content in the soil.

Higher content of Pb was found in the plants collected from Tanta region than that of Meet Khalaf region. This result may be duo to the intensive traffic at Tanta compared with Meet khalaf (branched road). Data also show that, there are wide variations in Pb content in the studied plant samples (plant species and plant part). In general, the concentration of Pb in all tested plants grown in all studied soils have exceeded the maximum limits concentration recorded in contaminated plants by Kabata Pendias and Pendias (1992), they stated that the maximum Pb concentrations in contaminated plants was ranged between 30-300 mg/kg dry weight. On the other hand, Gray (1992) noted that the safe levels of Pb in plants is ranged from 0.2 to 20 mg/kg dry weight. The increase of the distance from highaway resulted in a decrease of Pb content in the plant samples. Moreover, in Meet khalaf region, Pb content in shoots of cotton plants cultivated at 50 and 500 m from highway was 1720.13 and 1405.20 mg/kg respectively.

Finally, the data showed that the distribution of absorbed Pb within shoots and roots was varied according to plant species. The content of Cd, Co, Ni and Pb in the shoots of cotton plants was higher than roots, whereas this trend was adversed for corn. These differences in heavy metals distribution depend on its transfer rate from roots to shoots. Morever these results attributed to the variations between plants in their ability to heavy metals uptake and their tolerant to its high concentrations (Alloway, 1995 and Ensley, 2000). Also,the data in Tables (3) show that the trend of BCR of Cd was not clear where its value varied according to Cd content in plant and available Cd in the soil. Similar results were found by El-Sokkary and Sharaf (1996) and Eissa and El-Kassas (1999). Therefore edible plants should be cultivated for away from the traffic way.

REFERENCES

Abdel-Sabour, M. F.; A. S. Ismail and H.Abou-Naga (1995). Environmental impact of Cairo sewage effluent in El-Gabal El-Asfer Farm. Egypt. J. Soil Sci., 35: 225-237.

Aboulroos, S. A.; Sh. Sh. Holah and S. H. Badawy (1996). Background levels of some heavy metals in soils and corn plant, Egypt. J. Soil Sci., 36: 83-97.

Alloway, B. J. (1995). 'Heavy Metals In Soils". 2nd Ed., Blackie

Acadimic and Professional, U.K.

Blum,W.E.H.(1997). Cadmium uptake by higher plants. pp. 109-110, In the fourth fourth international conference on "The Biogeochemsitry o f Trace Elements". Clark keer campus, Univ. of California, Berkely, California.

Chapman, H. D. and P. F. Pratt (1961)." Methods of Analysis For Soils, Plants and Waters". Univ. of California, Riverside, U.S.A.

Cottenie, A.; M. Verloo; L. Kikens; G. Velghe and R. Camerlynck (1982). "Analytical Problems and Methods in Chemical Plant and Soil Analysis". Hand book Ed. A. Cottenie, Gent, Belgium (1982).

Eissa, A. M. and H. I. El-Kassas (1999). Impact of heavy metals on soils, plant and water at Abou-Zabal area. Egypt. J. Soil. Sci. 39 (3): 351-360.

El-Sokkary, I. H. and J. Lag (1980). Status of some trace element in Egyptian soils and wheat grains. Beiträge. Trop. Landwirtsch, Verterinärmed, 18: 35-47.

El-Sokkary, I.H. and A. I. Sharaf (1996). Enrichment of soils and plants irrigated by wastewater by zinc and cadmium. Egypt. J. Soil Sci., 36: 219-232.

Ensley, B. D. (2000). Rationale for use of phytoremediation, in: "Phytoremediation of Toxic Metals ", R askin, I and B. D., Ensley, Eds. pp. 3-11. John Wiley & Sons, Inc. New York.

Ernst, W. H. O. (1996). Bioavailability of heavy metals and decontamination of soils by plants. Applied Geochemistry, 11: 163-167.

Gray, N. F. (Ed.) (1992)." Biology of Wastewater Treatment". Oxford Science Publications, Oxford, pp. 105-108.

Holmagren, G. G. S.; M. W. Meyer; R. L. Chaney and R. B. Daniels. (1993). Cadmium, lead, zinc, copper and nickel in agricultural soils of the United States of America. J. Environ. Qual. 22: 335-348.

James, D.W.; R.J. Hanks and J.H. Jurinak (1982)." Modern Irrigated Soils". John Wiley and Sons, NY.

Kabata-Pendias, A. and H. Pendias (1992). Trace Elements in Soils and Plants. CRC Press, Flolrida.

Lindsay, W. L. and W. A. Norvell (1978). Development DTPA soil test for zinc, iron, nickel, manganese and copper. Soil Sci. Soc. Am. J., 42: 421-428.

Mengel, K. and E.A. Kirkby (1987). Principles of Plant Nutrition. International Potash Inst., Bernce, Switzerland.

Nofal, M.A. (1981). Effect of some sources of pollution on the uptake of certain nutritional elements by plants. M.Sc. Thesis, Fac. Agric., Ain Shams Univ., Egypt.

Nriagu, J. O. (1991). Human influence on the global cycling of trace metals, in: "Heavy Metals in the Environment", Farmer, J. G. Ed. CEP Consultants Ltd. Edinburgh. Vol. 11.

Rhoades, J. D. (1982). Reclamation and management of salt-affected soils after drainage. Proc. First Ann. Western Provincial Conf., Rationalization of Water and Soil

Research and Management, Lethbridge Alberta, Canada. pp. 123-197.
Shaban, Kh. A. (1998). Studies on pollution of some cultivated soils. M.Sc. Thesis, Fac. Agric., Zagazig Univ., Egypt.
Tantawy, Manal F. (1996). Extraction of some heavy metals as affected by soil properties. M.Sc. Thesis, Fac. Agric., Minufiya Univ., Egypt.

الطرق السريعة كمصدر للتلوث بالعناصر الثقيلة وأثر ذلك علي الأرض والنباتات المتاخمة بدلتا النيل بمصر

عادل محمد أبو الخير ؛ علي عبد الحميد بلبع ؛ محمد صفوت شمس؛ومنال فتحي طنطاوي
قسم الأراضي - كلية الزراعة - كفر الشيخ - جامعة طنطا - مصر

تم اختيار منطقتين بدلتا النيل بمصر لدراسة تأثير الغازات المنبعثة من مركبات النقل علي تلوث الأرض والنبات ببعض العناصر الثقيلة مثل الكادميوم والنيكل والكوبالت والرصاص . الأولي بطنطا علي طريق القاهرة الإسكندرية الزراعـي و الثانـية عند ميت خلف علي طريق شبين الكوم القاهرة .تم أخذ عينات من النبات القائم و الأرض(من الطبقة السطحية " ٠- ١٥ سم" وكذلك الطبقة تحت السطحية " ١٥ – ٣٠ سم ") من المنطقتين في ربيع ٢٠٠٣م علي مسافات ٥٠ ، ٢٥٠، ٥٠٠ و١٠٠٠متر من الطريق.

وتشـير النتائج إلى أن المحتوي الكلي والميسر من العناصر الملوثة تحـت الدراسـة لكل من الطبقة السطحية و تحت السطحية ينخفض بزيادة بعد المسافة عن الطريق وكان ذلك أكثر وضوحاً بالطبقة السطحية. وأخذ التركيز الكلـي لـتلك العناصر (ملليجرام/كم) الترتيب التالي :الرصاص (١٥٠,٧٠ – ٢٢,٨٨) > الكوبالت (٥٠,٤٠ – ١٠,٥٠) > النيكل (٥٠,٤٧ – ٩,١٥) > الكادمـيوم (٥,٨٨ – ١,٢٠) أمـا المحـتوي الميسـر فأخذ الترتيب التالي: الرصـاص (١٥,٢٥ – ١,٢٥) > النـيكل (٠,٧٥ – ٠,٢٠) >الكوبالت (٠,٣٥ – ٠,٠٧) > الكادمـيوم (٠,٠٥ – ٠,٠١) . كمـا أوضحت النتائج أن المحـتوي الكلـي أو الميسر من الكادميوم والنيكل والكوبالت أقل من المستوي الحرج بينما كان تركيز الرصاص أكبر من الحد الطبيعي.

اخـتلف كثيراً محتوي النبات من العناصر الملوثة تحت الدراسة وكذلك نسـبة التـراكم الحيوي تبعاً للمسافة من مصدر التلوث والنوع النباتي وجزء النبات .ووجد أن هذا المحتوي لنفس النوع النباتي ينخفض مع بعد المسافة عن الطريق . كان محتوي تلك النباتات من الكادميوم والكوبالت والرصاص تحت الدراسة بمنطقة طنطا اعلي من منطقة ميت خلف بينما كان المحتوي من النيكل عكـس ذلـك وكان محتوي تلك العناصر بالمجموع الخضري للقطن اعلي من المجموع الجذري وظهر عكس ذلك الاتجاه مع الذرة.وبناء علي ما سبق يجب زراعة المحاصيل الصالحة للأكل بعيداً عن الطرق المرصوفة.

تبني مربي الماشية لبعض الممارسات البيطرية ببعض قرى محافظة كفر الشيخ

د. عبد الجواد السيد بالى
باحث اول بقسم بحوث المجتمع الريفى -معهد بحوث الإرشاد الزراعى والتنمية الريفية

الملخص

استهدفت الدراسة التعرف على مستوى تبني مربي الماشية لبعض الممارسات البيطرية ، والتعرف على العوامل المرتبطة والمحددة لهذا المستوى ، وتم الاعتماد على الاستبيان بالمقابلة الشخصية لاستيفاء بيانات هذا البحث من ٢٧٠ مزارعاً تم اختيارهم بطريقة عشوائية من بين مربي الماشية بتسع قرى بمحافظة كفر الشيخ ، وقد استخدمت التكرارات والنسب المئوية ومعامل الارتباط البسيط والانحدار الخطي المتعدد وأسلوب الانحدار الخطي المتدرج الصاعد stepwise forward solution وتتلخص أهم النتائج التي أسفرت عنها الدراسة فيما يلي:

١. أن أقل الممارسات البيطرية تبنيا بين مربي الماشية هي التلقيح الصناعي (٢١,١%)، والاحتفاظ بسجلات للمواشي (٢٤,٨%) ، فحص الحيوان دوري (٣٢,٢%)، وعمل تحاليل للحيوان كل ٦شهور (٣٤,٨ %) ، واستدعاء الطبيب البيطري أثناء الولادة (٤٣,٧%)، وإعطاء الماشية عليقه جافة مركزة في موسم البرسيم (٤٥,٩%)، وعرض الماشية على الطبيب أثناء الحمل (٥٠ %) .
٢. انخفاض مستوى تبني الممارسات البيطرية إذ يقع حوالي ٣١,١ % ، ١٢,٥٩ % . في مستوى التبني فوق المتوسط والمرتفع .
٣. أن المتغيرات المستقلة مجتمعة تفسر نحو ٣٩,٦ % من التباين في مستوى تبني الممارسات البيطرية لمربي الماشية إلا أن معظم هذه النسبة يسهم فيها ستة متغيرات هي : المستوى التعليمي ، مستوى المعيشة ، التسهيلات البيطرية ، التعرض لوسائل الاتصال الجماهيري ، الانفتاح على العالم الخارجي ، قيادة الرأي الإنتاجي الحيواني .

وفي محاولة للوقوف على أكثر المتغيرات تأثيرا على المتغير التابع أسفر نموذج الانحدار التعددي عن خمسة متغيرات مستقلة تشرح ٣٥,٤ من التباين في مستوى تبني الممارسات البيطرية ، يعزى ٢٠,٣ % منها إلى درجة التعرض لوسائل الاتصال الجماهيري ، ١٠,١ % إلى المستوى المعرفي الانتاجي الحيواني ، ٢,٥ % إلى مستوى المعيشة ، ١,٤ % منها توافر التسهيلات البيطرية ، ١و١ % إلى قيادة الرأي الإنتاجي الحيوانى.

وهكذا يتضح لزيادة تبني الممارسات البيطرية بين مربي الماشية الاهتمام بربط الجماهير بوسائل الاتصال الجماهيري وتدعيم المادة العلمية التي تبث فيها ، والاهتمام بتوفر المعرفة الإنتاجية الحيوانية عند مربي الماشية بشتى الطرق ، ورفع مستوى المعيشة إذ أنه سبب ونتيجة في نفس الوقت ، وتوفير التسهيلات البيطرية ، والاهتمام بقادة الرأي في مجال الإنتاج الحيواني ومحاولة تدريبهم وإمدادهم بالمعارف والمهارات والاتجاهات الموالية لنشر الممارسات البيطرية بين المزارعين .