Impact of Industrial Activities on the Concentration of Lead and Mercury in Soils of Cultivated Lands at Abis and El-Nahda Regions, South Alexandria City, Egypt

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CULTIVATED soils south Alexandria city (Abis and El-Nahada) are subjected to contamination from different sources of industrial activities. These sources are distributed in the south and southwest of the city. The current study was carried out to assess the impact of these industrial activities on Pb and Hg levels in the cultivated soils of El-Nahda and Abis regions. The amounts of DTPA-extractable Pb from soils varied from 0.16 to 11.50 mg kg$^{-1}$.

Extremely high values of DTPA-Pb are found in soils of sites located near by the Black carbon plant at El-Nahda, self-burning municipal solid waste at Abis and industrial complex of El-Max. On the other hand, the lowest DTPA-Pb levels were measured in soils of sites at distance greater than 3 km south and southwest the hot spot sources. The amounts of total Hg in soil samples collected in 1985 varied from 0.30 to 1.75 mg kg$^{-1}$ and in those collected in 1998 from 0.15 to 1.45 mg kg$^{-1}$.

The main hot spot sources of Hg in the studied area are oil refining, petro chemicals, cement production, chemical industries of special interest is the chlor-alkal and self burning of municipal solid waste at Abis. Five topographic map sheets at scale 1:50,000 (Alexandria - Abo-Quir - Kafr El-Dawer - King Maruit and Abo El-Matamur) were analyzed using ArcGIS and a Digital Elevation Model (DEM) was produced. Elevation values ranged between 3 below sea level to about 30 meter above sea level. Descriptive variance analysis showed that DTPA-Pb has more variability than total Hg as the variance is much higher.

This is attributed to the greater number of soil samples (63) used in DTPA-Pb and organic carbon analysis compared to the number of samples (18) used for total Hg analysis. Geostatistical analysis, in ArcGIS, indicated that the DTPA-Pb and total Hg concentrations was best fitted Gaussian model while organic carbon was best fitted spherical model. The range showed that maximum interpolation of the concentration of Pb and OC at Abis-El-Nahda area were 7580.7–1634 m. The nugget variance of concentration of Pb and OC at Abis-El-Nahda area were 1.37–2231.3m.
Ordinary Kriging was used for DTPA- Pb and OC and showed that this variable represent high spatial dependence. On the other hand, Simple Kriging was used for total Hg in soils collected in 1985 and 1998 which showed no spatial dependency. The ordinary and Simple Kriging maps showed that the spatial distribution and interpolation of the concentrations of Pb, Hg and OC and also significant concentrations of these parameters were increased in the soils closer to the hot point source and then were decreased with distance. The challenges of sustainable agriculture development in El-Nahda and Abis depend on compliance and enforcement of environmental regulations in order to control Pb and Hg emission into the atmosphere. High concentration levels of Pb and Hg in the atmosphere can adversely affect the ecosystem and human health.

Local, regional and global biogeochemical cycles of lead and mercury have been affected to a great extent by man's activities. On a global basis, a number of estimates indicated that contributions from anthropogenic sources, for Pb and Hg to the soils, are at least two or three orders of magnitude greater than from natural sources (Nriagu & Pacyna, 1988). Lead and mercury emissions to the environment are dominated by dispersion and deposition on soils over vast area depending on particle size and wind speed and direction (Puxbaum, 1991). Soils contamination by these two elements is most common in regions affected by atmospheric deposition of Pb and Hg aerosols emitted from various industrial activities.

Lead is emitted to the atmosphere from various sources such as leaded gasoline and waste incinerator (Adriano, 1987; Alloway, 1995; Mielke, 1999 and Bang & Hesterberg, 2004). Also, waste incinerator, chemical industries such as chlor-alkali, electric equipments production and combustion sources such as cement production are significant sources of Hg emitted to the atmosphere (Adriano, 1987; Lindberg & Stratton 1989; Maserti & Farrar, 1991 and Neculita et al., 2005). It has been reported that significant contamination of soil by Hg would be produced by atmospheric deposition of Hg and this effect could occur in sites throughout distances up to a range between 2-5 km downwind the hot point source of the chlor-alkali plant (Elsokkary, 1989 and Maserti & Farrar, 1991). Several studies showed that gaseous Hg emitted from combustion sources and from waste incineration is deposited on soils by wet or dry deposition or by both (Lindberg & Stratton, 1989; Alloway & Ayres, 1993; Lindberg et al., 1995 and Alloway, 1995).

Assessment of the amount of total Pb in soils is not valid indicator of Pb phytoavailability. Therefore, chemically extractable Pb from soil is used as indicator of the amount available to plant. A number of extractants have been suggested to extract Pb from soil for predicting its availability to plants. These extractant are the DTPA-reagent (Lindsay & Norvell, 1978) which accounted more suitable for the environmental condition of Egyptian soils. However, this

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approach is not adapted for Hg because of lack in data on Hg extractability from soils and their relationships to plant uptake. As a result, total soil Hg measurement is quite satisfactory and is considered good indicator for assessing Hg contamination of agricultural soils.

During the last five decades, there were increasing concerns about soil contamination by Pb and Hg. The new approach for soil spatial variability can be basic for classifying soil attributes spatial data by using natural grouping and by employing a geographical information system (Burrough, 1987 and Zhang et al., 1996). Evaluating the environmental impact of contaminants such as Pb and Hg must start with a determination of its spatial distribution. This is especially important in an urban area considering the complex heterogeneous nature of soil. For a geostatistical layer, there are three standard ways in which data can be assigned: (i) equal interval, (ii) quintile, and (iii) natural grouping or smart quintile (Johnston et al., 2003). Natural grouping are used in thematic information extraction and pattern recognition (Jensen, 2005). Geostatistical techniques have been employed to describe the spatial distribution of several contaminants in soils (Atteia et al., 1994; Von Steiger et al., 1996; Bierkens, 1997; Goovaerts et al., 1997; Carlon et al., 2001; Van Meirvenne & Goovaerts, 2001 and Cattle et al., 2002). These techniques provide means to estimate either the value of a soil attribute at locations between samples, or the probability that the attribute value will exceed a given threshold at a particular location. Such information is essential for mapping potential risks to the environment or human health.

Spatial distribution, interpolation and maps of soil properties can be obtained by different techniques such as inverse distance calculations (Breget et al., 1992), factorial Kriging (Bocchi et al., 2000) or ordinary Kriging (Lopez-Granados et al., 2005). Bonifacio et al. (1996) showed that the spatial dependence of Pb in some agricultural soils, affected by industrial fallout, was evaluated in South Sardinia, Italy. They found that Pb was spatial dependence and their semivariogram was fitted the spherical model. Kriging cross validation was used to verify the measurement and the estimated values was plotted and related to the soil type.

The objectives of the present work were to assess (i) the magnitude of contamination of agricultural soils, south Alexandria city, by Pb and Hg, (ii) the spatial distribution and interpolation of DTPA-Pb, total Hg and organic carbon in soils, and (iii) the spatiotemporal variability of total Hg in soils.

**Material and Methods**

**Area study**

The studied area is located south Alexandria city. It is bounded by the latitudes 30° 33' - 31° 30' N and the longitudes 29° 50' - 30° 45' E. This area covers a vast cultivated land representing most Abis and El-Nahada Farms (Map 1). These lands are subjected to aerosols deposition from various industrial activities located in the western part of Alexandria city (mainly oil refining, petrochemicals, cement...
production, chemical industries of special interest is the chlor-alkali plant, self burning of municipal solid wastes and carbon black). According to the meteorological data, the prevailing wind direction is northwest with an average speed between 2.75 and 7.14 m/sec. This wind direction can enhance the transport of contaminants (Pb and Hg) from the hot spot sources to a long distance.

Map 1. TM image acquired on December, 2000 for location of the study area.

Soil sampling and analysis

Upper soil layer samples (0-10 cm) were collected from different sites which were geo-referenced using Global Positioning System (GPS) for 63 site at Abis - El-Nahada area for Pb and OC and 18 site at Abis area for Hg (Map 2). The soils were air-dried, ground in a wooden mortar, passed 2 mm sieve and stored for analysis. Proportion of this 2 mm sieved-soil was finely ground to pass 1 mm sieve for organic matter and trace elements analysis.

The amount of extractable soil lead (Pb) was obtained by extracting with DTPA-reagent (Lindsay & Norvel, 1978) and its concentration was measured by Perkin Elmer atomic absorption spectrophotometer. The amounts of total mercury (Hg) in soils were measured, after wet digestion, by cold vapor technique Varian atomic absorption spectrophotometer (Bernhard, 1976).

Descriptive statistical analysis

The data analysis was carried out using descriptive statistical parameters (minimum, maximum, mean, median, standard deviation and variance) and were calculated for DTPA-Pb, total Hg and organic carbon using SPSS software (2002) and the histograms for all variables were obtained.

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Building up digital georeference database

The spatial data was input by on screen digitizing five topographic map sheets at scale 1:50,000 (Alexandria – Abo-Quir – Kafr El-Dawer – King Maruitt and Abo El-Matamur) into ArcGIS (version 9) software (ESRI, 2004). The DEM was produced from the contour lines using interpolation technique throughout spatial analyst in ArcGIS software. TM image acquired on Dec. 2000 were obtained and input to ERDAS imagine software (version 8.5), (ERDAS, 2003).

GIS spatial modeling

Geostatistical analysis was carried out at a two steps: (a) the calculation of the experimental semi-variogram and fitting a model; and (b) interpolation through Ordinary Kriging, which uses the semi-variogram parameters (Stein, 1998). The semi-variogram is defined as a spatial dependence function of the distance "h" between locations in the observation space. Geostatistical analysis (Variogram model, Ordinary and Simple Kriging) for lead, mercury and organic carbon spatial variability were carried out using ArcGIS software (ESRI, 2004).

The variogram model tested in this study was: $\gamma(h) = C_0 + C f(h/a)$

Where $\gamma$ = semivariance, $h$ = separation distance, $a$ = range, $C_0$ = nugget, $C$ = sill, $f(h/a) = [h/a]$ for the linear-plateau; $f(h/a) = [1.5(h/a) - 0.5(h/a)^2]$ for the spherical; $f(h/a) = [1 - \exp(h/a)]$ for the exponential and $(h/a) = [1 - \exp- (h^2/a)]$ for the Gaussian model (Journal & Huijbegts, 1978 and Wackemagel, 1995). Ordinary Kriging takes into account both the structured and random characteristics of spatially distributed variables (soil DTPA-Pb and organic carbon), thus providing tools for their description and optimal estimation, while Sample Kriging was used for total soil Hg to improve spatial interpolation. This preliminary test indicated that the soil test values were best estimated using the

best fitted of variogram and ordinary Kriging as indicated by cross validation tests (Johnston et al., 2003). We used Smart quintiles to delineate classes based on natural grouping of data values (Johnston et al., 2003). Break points were identified, based on mathematical criteria that the computer uses to uncover statistical patterns that are inherent in the data.

Results and Discussion

Soil organic carbon

The amounts of organic carbon in soils varied from 0.03 to 2.65 % (Table 1) for samples collected in 1985 and from 1.85 to 2.70 % for samples collected in 1998. These values agree with the normal range of O.C. in both lacustrine and calcareous cultivated soils in the western part of Nile delta (Elsokkary & Laj, 1980). There was no special distribution pattern for O.C. in soil, but it varied according to cropping and cultivation practices (Fig. 1).

<table>
<thead>
<tr>
<th>Statistical Parameters</th>
<th>Abis- El-Nahada DTPA-Pb</th>
<th>O.C. %</th>
<th>Total Hg*</th>
<th>Total Hg**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>1.10</td>
<td>0.12</td>
<td>0.30</td>
<td>0.15</td>
</tr>
<tr>
<td>Maximum</td>
<td>11.50</td>
<td>2.65</td>
<td>1.75</td>
<td>1.45</td>
</tr>
<tr>
<td>Mean</td>
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<td>1.82</td>
<td>0.79</td>
<td>0.78</td>
</tr>
<tr>
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<td>2.53</td>
<td>1.45</td>
<td>1.30</td>
</tr>
<tr>
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<td>2.20</td>
<td>0.09</td>
<td>0.11</td>
</tr>
<tr>
<td>Mode</td>
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<td>2.40</td>
<td>0.75</td>
<td>0.85</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>0.35</td>
<td>0.77</td>
<td>0.30</td>
<td>0.46</td>
</tr>
<tr>
<td>Variance</td>
<td>7.91</td>
<td>0.59</td>
<td>0.15</td>
<td>0.21</td>
</tr>
<tr>
<td>Skewness</td>
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<td>1.01</td>
<td>0.70</td>
<td>0.05</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>0.91</td>
<td>0.54</td>
<td>0.51</td>
<td>1.59</td>
</tr>
<tr>
<td>No. of sample</td>
<td>63</td>
<td>63</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

* Measured in 1985 ** Measured in 1998

Fig.1. Frequency distribution of soil organic carbon (%).

Soil DTPA-extractable Pb

The amounts of DTPA-extractable Pb varied from 0.16 to 11.50 mg kg⁻¹ (Table 1). These levels are greater than the Background level (0.15 mg kg⁻¹) for soils collected from this area (Elsokkary & Lag, 1980). Extremely high values of DTPA-Pb are found in soils of sites located near by the black carbon plant, self-burning municipal solid waste of Abis and industrial complex of El-Max. On the other hand, the lowest DTPA-Pb levels were measured in soils of sites at distance greater than 3 km south and south west the hot spot sources. Sutherland (2000) found that the amounts of 0.5 M HCl extractable Pb in the topsoil (0-2.5 cm) of roadside of an urban area were in the range 0.8 - 2.870 mg kg⁻¹ and were also greater than the background levels (range of 5 - 17 mg kg⁻¹). He reported that these soils are anthropogenically contaminated with Pb from vehicle emissions. Fig. 2 shows the frequency distribution of DTPA-Pb in soils. These data show that DTPA-Pb has high variability in soils.

Soil total mercury

The amounts of total Hg in soil samples collected in 1985 varied from 0.30 to 1.75 mg kg⁻¹ and in those collected in 1998 varied from 0.15 to 1.45 mg kg⁻¹ (Table 1 and Fig. 3 and 4). According to the background level of total Hg in the soils of these two regions (0.078 ± 0.16) reported by Elsokkary & Lag. (1980), these soil are heavily contaminated by Hg. The main hot spots sources of Hg in the studied area are oil refining, petrochemicals, cement production, chemical industries of special interest is the chlor-alkali production and self burning of municipal solid waste at Abis.

Fig. 2. Frequency distribution of soil DTPA-Pb (mg kg⁻¹).

The observed lower levels of total Hg in soils collected in 1998 is due to that the Hg-cells of the chlor-alkali plant were replaced in 1995 by another new clean technology in order to avoid Hg emission to the surround environment. However, the high values of total Hg measured in 1998 are related to sites affected by the former Hg cells of the chlor-alkali plant and also to the self-burning of solid waste.

at Abis dumpsite. This point out that Hg can be tightly bound by soil complexes, especially organic materials, against loss in the atmosphere by volatilization (Elsokkary et al., 1991; Stern et al., 1996; Lindberg & Stratton, 1989; Rule et al., 1998; Bloom et al., 2003 and Neculita et al., 2005).

Maps 6 and 7 shows the spatial and temporal distribution of total Hg in soils collected in 1985 and 1998, respectively. It is clear that the levels of total Hg in soils decreased with distance from the hot spot of El-Max industries and from the municipal solid waste dumpsite of Abis. Data reported in Elsokkary (1985); Rule & Iwashchenko (1998) and Biester et al. (2002) showed that atmospheric Hg emitted from chlor-alkali plant is deposited over waste area depending on wind direction and speed.

![Fig. 3. Frequency distribution of total Hg (mg kg⁻¹) in 1985.](image1)

![Fig. 4. Frequency distribution of total Hg (mg kg⁻¹) in 1998.](image2)
Concentrate variability

Descriptive variance

The statistical analysis of DTPA-Pb, total Hg and organic carbon are shown in Table 1. It is clear that DTPA-Pb has more variability than total Hg as the variance is much higher. This is attributed to the greater number of soil samples (63) used in DTPA-Pb and organic carbon analyses compared with the lower number of samples (18) used for total Hg analysis. The histograms for organic carbon, DTPA-Pb and total Hg are shown in Fig. 1, 2, 3 and 4. The distribution of these variables is positively skewed, indicating the dominance of low values with the presence of a little high value that might have an impact on the final estimates (Issaka & Srivastava, 1989). On the other hand, variance indicates that DTPA-Pb has spread on a wide range contrary to total Hg, which is distributed around a high number of samples with low values. The occurrence of high levels of total Hg is related mainly to sites located at close proximity from the industrial complex of El-Max and the solid waste dumpsite of Abis while the low levels are measured in soil samples far away from these hot spots.

Spatial and temporal variability

The topographic analysis of the contour lines and spot heights (Map 2) produced a Digital Elevation Model (DEM) for the studied area. Elevation values ranged between 3 below sea level to about 30 meter above sea level (Map 3). The DTPA-Pb data were best fitted Gaussian model while organic carbon data were best fitted spherical model (Fig. 5). The range showed that maximum interpolation of the concentration of Pb and OC at Abis-El-Nahda area were 7580.7 - 1634 m (Table 2) The nugget variance of concentration of Pb and OC at Abis-El-Nahda area were 1.37 - 2231.3 m (Table 2). Total DTPA-Pb and OC represented high spatial dependence. On the other hand, soil total Hg in (1985 & 1998) did not show spatial dependency.

Map 3. Digital elevation model (DEM) of the study area.

The most fitted models of lead

**Fig. 5.** The semivariogram for soil DTPA-Pb mg kg\(^{-1}\) and their fitted models.

**TABLE 2.** Variogram model parameters of DTPA-Pb and organic carbon (\%).

<table>
<thead>
<tr>
<th>Property</th>
<th>Model</th>
<th>Abis- El-Nahada Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nugget</td>
<td>Sill</td>
</tr>
<tr>
<td>DTPA-Pb</td>
<td>Gaussian</td>
<td>1.377</td>
</tr>
<tr>
<td>Organic Carbon %</td>
<td>Spherical</td>
<td>2.23</td>
</tr>
</tbody>
</table>

The Ordinary Kriging maps showed the spatial distribution and interpolation of concentrations of DTPA-Pb and OC (Maps 4, 5) while the Simple Kriging maps showed the spatial and temporal variability of total soil Hg in 1985 and 1998 (Maps 6 and 7) according to Webster & Oliver (2000). These maps, for concentrations of these parameters, showed significant increase with space and time in the soils closer to the sources of contaminants and significant decrease with distance from these sources.

**Conclusions**

The results obtained in this study showed extremely high values of DTPA-Pb in soils of sites located near by the Black carbon plant of El-Nahda, self-burning municipal solid waste dumpsite of Abis and industrial complex of El-Max. The main hot spot sources of Hg in the studied area are oil refining, petrochemicals, cement production, chemical industries of special interest is the ex-chlor-alkal plant and self burning of municipal solid waste.

Map 4. Ordinary kriging of soil DTPA-Pb (mg kg⁻¹).

Map 5. Ordinary kriging of soil organic carbon (%).
Map 6. Simple kriging of soil total Hg (mg kg⁻¹) in 1985.

Map 7. Simple kriging of soil total Hg (mg kg⁻¹) in 1998.
Digital Elevation Model values ranged between 3 below sea level and about 30 meter above sea level of the study area. Descriptive variance analysis showed that DTPA-Pb has more variability than total Hg as the variance is much higher. This is attributed to the greater number of soil samples (63) used in DTPA-Pb and organic carbon analysis compared to the low number of samples (18) used for total Hg analysis. These analyses showed that DTPA-Pb and OC represented high spatial dependence while values of total Hg in 1985 and 1998 represented no spatial dependency. Also, the DTPA-Pb was best fitted Gaussian model while organic carbon was best fitted spherical model. The range showed that maximum interpolation of the concentration of Pb and OC at Abis-El-Nahda area were: 7580.7 – 1634 m. The nugget variance of concentrations of Pb and OC at Abis-El-Nahda area were 1.37 – 2231.3 m. The Ordinary Kriging maps show that the spatial distribution and interpolation of concentrations of DTPA-Pb and OC, while the Simple Kriging maps show the spatial and temporal variability of total soil Hg in 1985 and 1998 maps.

**Recommendations**

Increasing community awareness of environmental issues and stringent environmental legislation has made it necessary to identify and assess Pb and Hg contaminated sites. The challenges of sustainable agriculture development depend on compliance and enforcement of environmental regulations in order to control lead and mercury emissions into the environment. The awareness and the strong focus on our environment together with the development of technical monitors and telemetric systems have made environmental data more readily available to planners, authorities and to the public. Enhancing the environmental awareness for both residents and workers through the governmental and non-governmental organizations (NGO’S) is a vital importance for human and ecosystem safety.

**References**


INDUSTRIAL ACTIVITIES ON THE CONCENTRATION OF LEAD 23?


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تأثير الأنشطة الصناعية على تركيز الرصاص والزئبق بالراضي المنزوعة بمناطق أبيس والنهضة - جنوب مدينة الاسكندرية - مصر

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تتعرض الأراضي الزراعية جنوب مدينة الاسكندرية (أبيس والنهضة) للتلوث من مصادر مختلفة ناتجة عن الأنشطة الصناعية حيث تتوزع هذه المصادر في جنوب وجنوب غرب المدينة. وتهدف هذه الدراسة إلى تقييم الأثر البيئي لهذه الأنشطة الصناعية على موقف عنصر الرصاص والزئبق في هذه الأراضي.

وقد أوضحت نتائج هذه الدراسة أن قيم عنصر الرصاص المتاح المستخلي بمحلول DTPA قد تراوحت من 16.2 إلى 41.1 ملليجرام/كم أرض. ووجد أن القيم المرتقبة من الرصاص قد تواجدت في المواقع القريبة من كل من مصنع أسود الكربون منطقة النهضة والنتيجة عن حرق المخلفات الصوبية للمدينة في موقع مصنع السماد العضوي من منطقة أبيس وكذا العديد من المصانع بمنطقة المكس.

وعلى الجانب الآخر فقد وجد أن مستويات الرصاص المخفضة بالترية توجد في مواقع على مسافة تزيد عن 3 كم جنوب وجنوب غرب المصدر الملوثة. كذلك أوضحت الدراسة أن تركيزات الزئبق الكلى التي تم جمعها عام 1985 قد تراوحت من 0.35 إلى 7.50 ملليجرام/كم أرض وتعتبر هذه الأراضي شديدة التلوث بعنصر الزئبق وقد وجد أن مصدر التلوث بالزئبق هو مصانع استخلاص الزيتوين والبروكومياتات وانتاج الأسمنت وكذا الناتجة عن حرق المتبقيات من المخلفات الصوبية للمدينة.

تجمع 5 خرائط طبوغرافية بقياس رسم 1 : 500000 (اسكندرية - أبي قير - فكدر الدوار - كنز مريوط - أبو الماطيري) وتم إدخالها وعمل ArcGIS Digitizing لتحويلها إلى صورة رقمية وتحليلها باستخدام برنامج ArcGIS. عملي نموذج الارتفاع الرقمي حيث تراوحت قيم الارتفاعات من 32.3 (ما تحت مستوى سطح البحر) إلى 60.23 (فوق مستوى البحر). وقد أوضح تحليل التباين المستخدم أن قيم الرصاص المتاح أكثر اختلافًا وتفاوتًا من الزئبق الكلى وذلك يرجع لعدد العينات المستخدمة (13) في حالة الرصاص والكربون العضوي أما الزئبق فكانت العينات المستخدمة أقل (8). وبالنسبة للتحليل الجيولوجي (المنكي) باستخدام برنامج Gaussian model اتضح أن تركيز الرصاص المتاح اتتبع نموذج ArcGIS بينما الكربون العضوي قد اتبع نموذج spherical model لزئبق الكلى أما بالنسبة لقيم المدى للرصاص والكربون نموذج pure nugget للزئبق الكلى ونحو 7580 إلى 1344 م. واتباع النموذج Ordinal Kriging تراوحت من 10.3 إلى 2331 م. كذلك تم استخدام خرائط الكربون العضوي وكذلك التباين مع المسافة مرتفع بينما تم
استخدام خرائط Simple Kriging لكل من الزنبين الكلي بالأراضي لعامي 1985 و 1998 لأن التباين مع المسافة غير واضح. كذلك أوضحت خرائط التركيزات المرتفعة من عناصر الرصاص والزنبيك كانت بالقرب من مصادر التلوث. ويعتبر تلوث هذه الأراضي التحدي لتطوير الزراعة المستدامة بمناطق النهضة والجبيل. لذا يجب الاعتماد على تطبيق قوانين البيئية والتحكم في مصادر التلوث التي تؤثر سلباً ومباشرةً على الأراضي الزراعية ونتاجها. ويعتبر التلوث بعناصر الزنبين والرصاص ذات تأثير سلبي على كل من النظام البيئي الزراعي وصحة الإنسان.