Research Article

Contamination of Roadside Soil with Lead in Damascus

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ABSTRACT

A study of lead in roadside soils is critical in assessing the potential environmental impacts of automobile emission on the soil. The soil samples were collected and analyzed for the levels of Pb using flame atomic absorption spectrometry. The results show that the concentrations of lead in samples taken from the soil adjacent to the main streets higher than the concentrations of lead in samples taken from the soil adjacent to the side streets, and show that there is a Positive correlation between concentrations of lead in soil samples and the traffic volume, which is a strong correlation where: R = 77.

Keywords: Lead, soil, street.

INTRODUCTION

Damascus as the capital of Syria is full of commercial and public service activities. For this reason, Damascus is densely populated. Damascus attracts the activities of inhabitants of neighbouring towns and villages migrating into it using various automobiles. Vehicular discharge of numerous gaseous and trace metals contaminants due to incomplete combustion of petroleum fuel adversely affects the soil and human[1]. A strong evidence of this phenomenon is the roadside soil that often shows a high degree of lead contamination that can be attributed to motor vehicles[1]. The pollution of soils by lead from automobile sources is a serious environmental issue. Lead is widely distributed in the environment and not biodegradable[2]. Lead is the major metal pollutant of the roadside environments and is released from fuel burning, wear out of tyres, leakage of oils, and corrosion of batteries and metallic parts such as radiators etc. Therefore it is commonly known that high concentrations of lead occur within 100 m of major road highways and near urban centres, hence directly impacting on surrounding soils[3,4]. Contamination and subsequent pollution of the environment by lead have become an issue of global concern due to their sources, widespread distribution and multiple effects on the ecosystem[5].

Aim of this research

The study of lead in the soil in different parts of Damascus and Damascus countryside reflects the extent of lead contamination of these regions. That soil lead contamination, we can make a quantitative measurement of lead, and then take the advantages of the results of this measurement to know the extent of lead contamination of the surrounding environment in the studied areas. Also accompanied by monitoring lead levels in soil samples with work on the interpretation of these results with links causes of human activities in the areas of sampling and which are a source of lead contamination.

MATERIALS AND METHODS

Samples Collection

Six samples of soil were collected from the surface layer of soil adjacent to six main streets in Damascus and six samples of surface layer of soil were collected from the surface layer of soil adjacent to six side streets. Fourteen samples of soil were also collected from the surface layer of soil adjacent to fourteen streets in Damascus varying among other with the traffic volumes.

Method of Analysis

The collected soil samples were air dried and mixed thoroughly with the aid of agate mortars. The soil samples were then sieved through a 2mm and 0.5mm plastic sieve to obtain fine particles. 0.5 g each of the dried sieved samples was picked by the aid of a high precision analytical balance. Subsequently, the samples were put in 250 mL glass beakers and digested in 12mL of aqua regia on a hotplate for 3 h at 110°C. After evaporation to near dryness the sample was diluted with 20 mL of 2% (v/v with H_2O) nitric acid and transferred into a 100-mL volumetric flask after filtering through Whatman no. 42 paper and diluted to 100 mL with deionized distilled water to get ready for the measurement of the concentration of lead by atomic absorption spectrometry[6,7].

RESULTS AND DISCUSSION

The level of lead in samples that were collected from the surface layer of soil adjacent to main streets and side streets in Damascus:

Table 1: The lead concentration in samples that were collected from the soil adjacent to main streets and side streets in Damascus

Main street	Lead concentration (ppm)	Side street	Lead concentration (ppm)
R1	163	r1	67,6
R2	115.3	r2	46.3
R3	265	r3	25
R4	113.6	r4	28.6
R5	260	r5	57
R6	102.3	r6	50

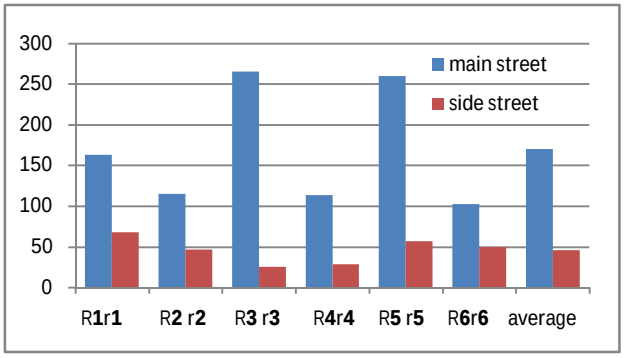

Figure 1: Comparison between the concentration of lead in samples that were collected from the soil adjacent to main streets and side streets in Damascus

The average concentrations of lead in the soil of the main streets are equals 169.9 ppm, while the average concentrations of lead in soil the streets subset are equals 45.7 ppm. The concentrations of lead in samples taken from the soil adjacent to the main streets higher than the concentrations of lead in samples taken from the soil adjacent to the side streets.

Table 2: The lead concentration in samples that were collected from the soil adjacent to fourteen main streets in Damascus varying among other with the traffic volumes

Street	Lead concentration (ppm)	Traffic volume
A1	260	117941.02
A2	163	86268.675
A3	115.3	36873.318
A4	102.3	33715.74
A5	61.6	30370.142
A6	51.3	28250.57
A7	25	5735.312
A8	118	100357.57
A9	80	57103.76
A10	68	56130.56
A11	89	55992.02
A12	141.5	46912.84
A13	124.5	18014.63
A14	50	13084.54

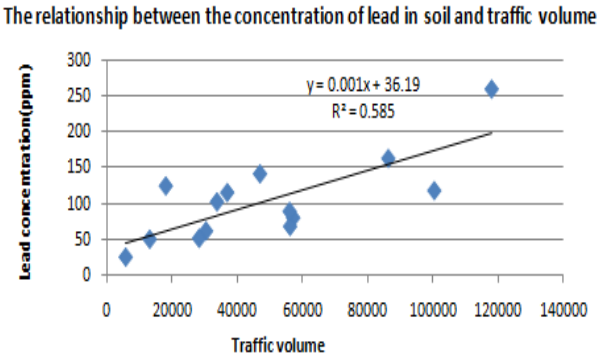

Figure 2: Line graph of the equation of correlation between the concentrations of lead in soil and the abundance of traffic in the areas of sampling

The level of lead in samples that were collected from the surface layer of soil adjacent to fourteen main streets in Damascus varying among other with the traffic volumes (table 2).

There is a Positive correlation between concentrations of lead in soil samples and heavy traffic, which is a strong correlation where: R = 77. The concentration of lead in soil increases with increasing traffic volume. The high mean value of the concentrations attested to the overall high level of contaminations of this metal in the roadside environments. This is in agreement with the report of Lagerwerff and Specht (1970)[8]. The high concentrations of lead observed could be attributed to lead particle from gasoline combustion which consequently settles on roadside soils.

CONCLUSION

The roadside environment had a significantly high content of lead, and generally their levels increased with increasing traffic volumes and become elevated in urban areas. In Damascus motor vehicles that burn leaded gasoline are mostly responsible for the buildup of lead in soil along the highway through the emissions of particulates.

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