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# Evaluation of Heavy Metals Contamination Levels of Street Dust in Nasiriyah city, Iraq

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**Abstract**

Heavy metal pollution in roadside soil fuel stations has been recognized for a long time of Nasiriyah city, south of Iraq. The study was conducted to examine the heavy metals content of three fuel stations in the nearby soil and control sample from rural area. The accumulation of heavy metals was tested, including the Lead (Pb), Nickel (Ni), Chrome (Cr) and Arsenic (As). Heavy metals were detected by using an atomic absorption spectrometer. The concentrations of Pb, Ni, Cr, and As in roadside soil was affected by fuel stations. Significant difference ($p<0.05$) in Pb, Ni, Cr, and As content were found in nearby soil samples of fuel stations compare with control sample. The results showed that urban samples had significantly ($p<0.05$) higher heavy metals compared to rural samples in all heavy metals studies. The results indicated that the rural area had the lowest heavy metals content compared with nearby soil samples of fuel stations. It could be concluded that impaction of fuel station on the accumulation of heavy metals in roadside soils in urban area was slight.

**Keywords:** Heavy Metals**,** Urban area**,** Rural Area, Pollution Roadside

## Introduction

Street dust is a major source of air pollution and soil in [1]. It consists of metal and organic molecules that accumulate on the roofs of the roads and arise from industrial motives, car traffic and natural sources. A few studies have been published on the content of trace elements in street dust so far [2-3]. Soil pollution was discussed near the transport methods more repeatedly. No studies have yet been conducted with regard to the comprehensive evaluation based on an indicator of street dust pollution with heavy matels in cities. Atmospheric pollution is a major challenge in many countries, especially those under rapid development [4]. During the combustion of wood and fossil fuels, waste combustion, high-temperature industrial processes also traffic, and dust containing trace metals are released into the atmosphere [5]. Dust particles can affect human health [6], especially the presence of heavy metals, which are harmful to humans by inhalation or ingestion [7]. Heavy metals/metallic contamination in dusts is a problem due to their lack of biodegradability, widespread presence, and toxicity, as well as their ability to accumulate over time [8]. Heavy metals, including Ni, Cd, Pb, Zn, Cu, Hg, Cr and others refer to metals with densities > 5 g/cm$^3$ [9]. Heavy metals/metalloids pollution in dust is an irreversible process and very difficult to remove once it occurs [10]. They also have the potential to cause biomagnification

and bioaccumulation in the ecosystem [11]. Indecorous disposal of engine oil, brake fluid, transmission oil, and leaded gasoline around the vicinity of the fuel contributes to carrying heavy metals/metalloids [12]. [13] Determining the source of heavy metals / metalloids is critical for effective dust treatment and pollution control [14]. The study aim was to evaluate the content of street dust pollution with heavy metals (Pb, Ni, Cr, and As) and to determine the role of human influence on the spatial difference of pollution in Nasiriyah city, south of Iraq

## Materials and Methods

### Study Area

Soil samples of four different location (S1, S2, S3 and S4) were collected from roadside of fuel stations of Nasiriyah city while S4 was collected from rural area**.**

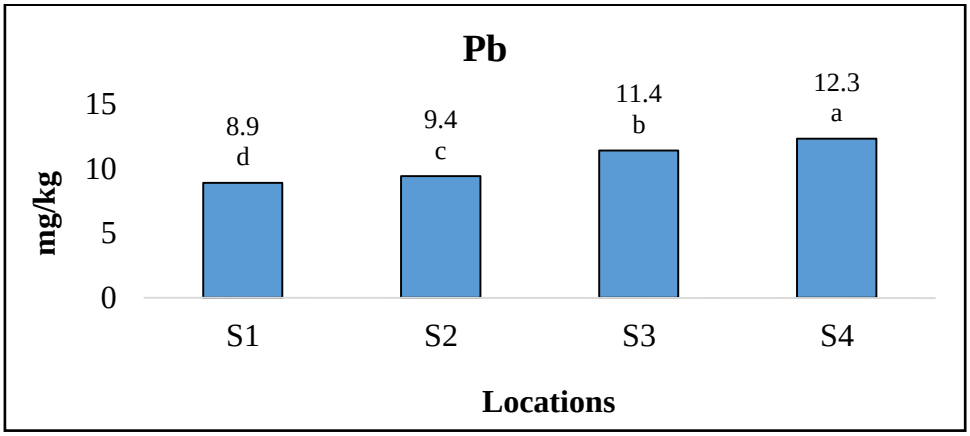
### Soil Samples

For the soil samples, a depth of 15 cm was dug from the surface of the soil to collect the samples. After the samples were collected, they were immediately placed in sealed plastic bags and labelled. The soil samples were then dried at air dry for 72 hours to remove all the moisture content. After drying, the samples were repeatedly crushed with clean mortar, pestle and sieved through a 250 µm sieve to fineness. Collected soil samples were air-dried in the laboratory before being ground and sieved using a 250µm mash [15]. All the materials and tools used in this study were immersed in a solution of 10% Nitric acid ($HNO_3$) for three days, rinsed twice with distilled water and with deionized water.

### Statistical Analysis

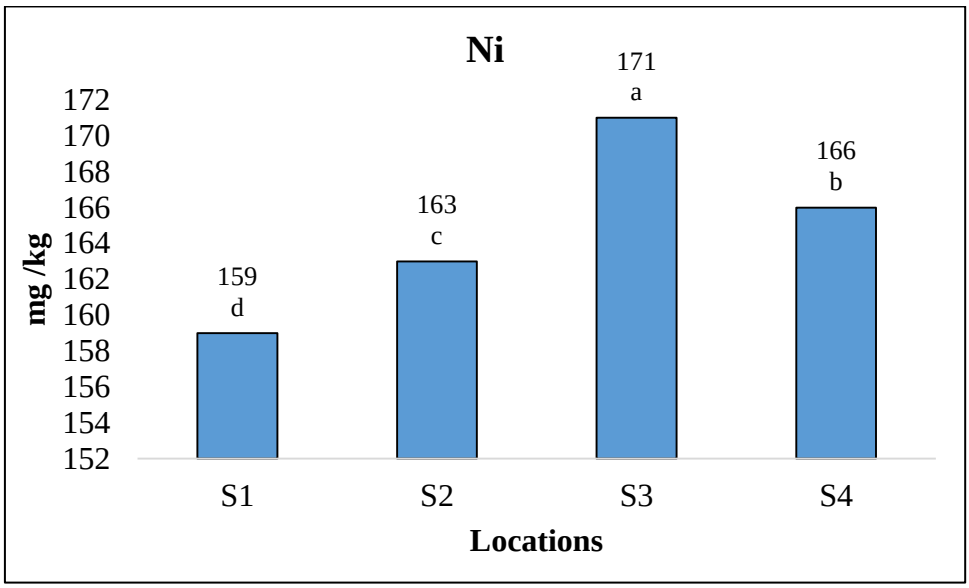
All the analyses were conducted in triplicates. The heavy metals soil samples were evaluated with the one-way ANOVA and Duncan triplicates range test using SPSS software (SPSS ver.23). P values less than 0.05 were considered to be statistically significant.

## Results and Discussion



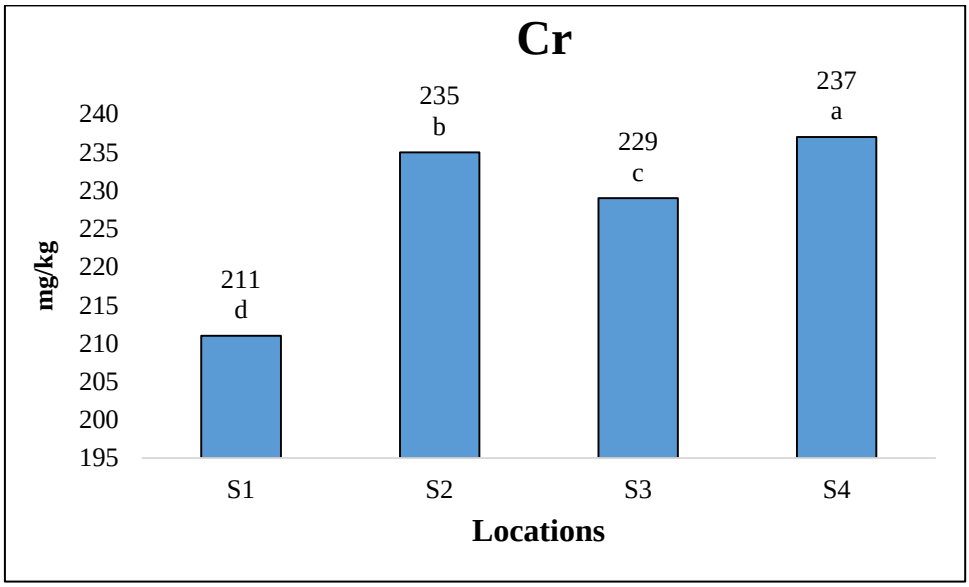

[a–d] Different letters indicate significant difference (P< 0.05)

**Fig. 1:** Pb concentration in the four soils of the study area



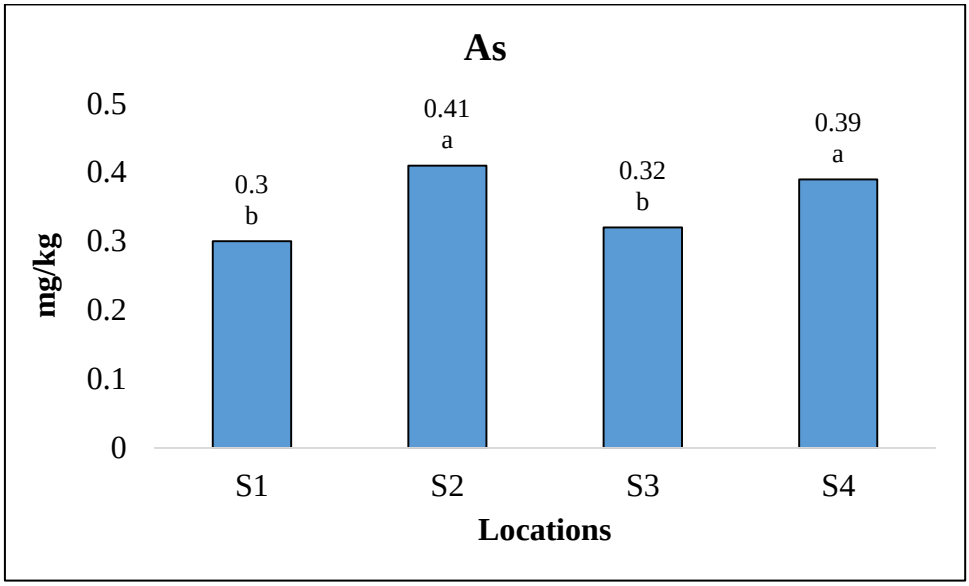

[a–d] Different letters indicate significant difference (P< 0.05)

**Fig. 2:** Ni concentration in the four soils of the study area




[a–d] Different letters indicate significant difference (P< 0.05)

**Fig. 3:** Cr concentration in the four soils of the study area




[a–d] Different letters indicate significant difference (P< 0.05)

**Fig. 4:** As concentration in the four soils of the study area

The amount of Pb in roadside soil fuel stations was higher than those in rural area as shown in (Fig. 1). The soil from Nasiriyah city showed the highest content of Pb (12.3 mg/kg). The Pb content in agricultural lands out of side the city is 8.9 mg/kg. General rural area S1 low content of Pb in agricultural lands close to Euphrates River compared to the samples from roadside soil fuel stations S2, S3 and S4. Comparing lead content from this study and other result is difficult because of the fact that concentration of lead can be affected by location, extracting solvent, soil texture, depth and environment, [16-17] reported that the lead values for three different locations were informed between 0.12- 35 mg/kg. The total of Pb in the roadside soil fuel stations was highest its rural value in soil which shows that the total of lead in this soil was in the safe level. The content of Ni in roadside soil fuel stations samples (Fig. 2) were higher compared with in rural sample. Among the metals studied, Ni was the metal found in the highest concentration at the three locations studied (Fig. 2) S2, S3 and S4. The Ni content was highest in in roadside soil fuel stations samples 171 mg /kg follow by rural area 159mg/kg. The Cr concentration (Fig. 3) in roadside soil fuel locations samples was higher than those in rural area as shown in (Fig. 3). 229 - 237 mg/kg. Between the locations studied, the Ni concentration in the three station S2, S3 and S4 were different. The highest As concentration was found in Nasiriyah city soil 0.41 mg/kg (Fig. 4), and the lowest As content was in agricultural lands 0.30 mg/kg. The reason maybe because of the high and low content of AS probably depended mostly on fuel stations and human activity. The presence of Pb, Ni, Cr, and As content in urban soil may come from traffic sources, especially fuel station, pesticides, vehicle tires and motor vehicle emissions due to the location of this site just near a busy road and many vehicles go in and out from this location [18-9].

## Conclusion

Heavy metals content of three fuel locations in the nearby soil are related to the location in the city. Soil near sources of pollution such as main roads and fuel station increase the accumulation of heavy metals by about 25% as much as this of soil in rural area of pollution. The results indicated that for all locations of fuel stations had effect on heavy metals content. Locations near fuel stations gave the highest content of Pb, Cr, Ni and As compared with rural area

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