Pollution of plants by lead from power generators in Diwaniah City-Iraq

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Abstract

In recent years domestic Power generators in Iraq became the backbone for electric power in Iraq. In this work the concentration of lead has been measured in plants that in exposure to the smoke of exhaust of domestic power generators. Specimens have been taken from different type of plants in different distances (very close, far in 10m and very far (control)) from the domestic power generators. By using atomic absorption spectroscopy lead concentrations has been measured, lead in distance (very close, far in 10m) shows a higher concentration than lead in control plants.

Introduction

The pollution that comes from the domestic power generators is a problem, only Iraq suffers from it. The common domestic power generators that used are work by gasoline. Gasoline use as a fuel for vehicles and many engines it contain alkyl lead compound as anti knocking additives, composition of the fuel will convert anti knocking additives(alkyl lead) to poisonous lead compounds.

Lead is (a toxic heavy metal) have atomic number equal to 83 with 208 atomic weight .that is released into the environment through industrial sources, the previous use of leaded gasoline disposal of lead wastes, flaking of lead-based paint. Individuals are exposed every day to varying amounts of lead in our diets, water, air and soil.(1). House dust may contain lead originating from contaminated soil or from lead-based paint.(2)

Lead is a naturally occurring metallic element found in the earth's crust at about 15 grams per ton. Lead does not generally occur in pure form, but exists in several mineral forms including lead sulfide, lead sulfate, lead carbonate and lead oxides. The metal is widely used for its malleability, density, low melting point, corrosion resistance, and opacity to x-rays and atomic radiation (3). Lead is also used as an ingredient in pigments for paints, enamels, ceramic glazes, glass, plastics and rubber(4). Lead is used in metallurgy to make lead alloys, such as those used for bearings. It is widely used in storage batteries and has also been used to make solder, foils, coverings for cable, and ammunition. Despite its usefulness, lead is toxic to humans (5).

The primary ways of lead to enter the body are through inhalation of lead dust and ingestion of lead paint chips, dust, or debris. In the general population, there is a fairly even split between ingestion and inhalation exposure routes(6).

Adults who are exposed to lead can suffer from digestive problems, nerve disorders, memory and concentration problems, high blood pressure, hearing problems, muscle and joint pain, and reproductive problems. children with high levels of lead in their bodies can suffer from learning disabilities, behavioral problems, slowed growth, hearing problems, headache and brain damage.(7)

At high concentrations, lead is toxic to plants. High lead levels depress

growth, and decrease organogenesis and protein and nucleic acid synthesis lead affects metal distribution in the plants and sometimes increases the excretion of toxic elements.(8).

Experimental part

1. Sample cultivation:

Specimens have been cultivated in different distances (very close, far in 10m and very far (control)) from the domestic power generators. Four kinds of plants had been studied from different locations with 1-2m in long and the samples were taken from the lower leaves of those plants. Water that added to the plants during growth is a tap water for control and polluted samples.

Specimen's leaves cultivated in plastic container its volume 500cm^3 with high 15cm. specimen's leaves dried in oven at 40C^0 for 24 hours. The dried leaves crashed in mortar.

2. Sample treatments

1gm of sample was accurately weighted and carefully heated at 45C^o with 12.5 ml nitric acid (HNO_3) in 250ml beaker (treated with concentrated nitric acid to clean it from any metal and then washed with deionized water) followed by gentle heating for 15 min. and cooling, after cooling 37ml of water were added and heating resumed for 10min. finally the solution were cooled the made up to 100ml volume with distilled water [9].

3. Measurements

Lead concentration (in ppm) has been measured using Varian Tectron AA-775 atomic absorption spectrophotometer.

Results and discussion

Four kinds of plants had been studied *Ficus sp*, *Phoenix sp*, *Ricinus sp* and *Zizyphus sp*. Each sample has been taken from leaves of those plants because the leaves are the most important part of plant that exposed to the atmospheric pollutants.

Samples taken from three different distances (1-very close, 2- far in 10m and 3-very far (control)) from the source (domestic power generator) these distances taken to eliminate (as possible) the effect of other pollutants.

Atomic absorption spectrophotometric readings for lead (*Zizyphus sp* (table 1), *Ficus sp* (table 2), *Phoenix sp* (table 3), *Ricinus sp* (table 4)) show a high concentration at distance no. (1) And less than this value in distance no. (2). all readings show relatively higher concentration than the control one.

This difference in values due to the difference in distances, that will make a higher of lead oxides on the leaves closer to the source (domestic power generator) so that will make the leaves of the four kinds of plant more exposure to lead oxide diagrams 1, 2, 3 and 4 for *Ficus sp*, *Phoenix sp*, *Ricinus sp* and *Zizyphus sp* respectively show the relation between lead concentration and distance all diagrams show dramatic increasing in lead concentration as the leaves became close to source. .

Readings had been repeated for two times for all the four kind of plant.

As a net result atomic absorption spectrophotometric readings showed a high lead concentration in all the samples than in control one which indicates pollution by lead oxide.

Table (1) show Pb concentration (ppm) in *zizyphus sp*

distance	Conc. in exp.no.(1)	Conc. in exp.no.(2)	Conc. in exp.no.(3)	Conc. in exp.no.(4)	Conc. in exp.no.(5)	average
Control	0.02	0.021	0.019	0.0181	0.021	0.0198
Very close	0.12	0.09	0.099	0.096	0.31	0.106
Far in 10 m	0.1	0.095	0.13	0.095	0.14	0.11

Table (2) show Pb concentration (ppm) in *Ficus sp*

distance	Conc. in exp.no.(1)	Conc. in exp.no.(2)	Conc. in exp.no.(3)	Conc. in exp.no.(4)	Conc. in exp.no.(5)	average
Control	0.01	0.013	0.011	0.01	0.013	0.0114
Very close	0.2	0.23	0.21	0.20	0.19	0.27
Far in 10 m	0.22	0.21	0.19	0.22	0.19	0.2

Table (3) show Pb concentration (ppm) in *phoenixs sp*

distance	Conc. in exp.no.(1)	Conc. in exp.no.(2)	Conc. in exp.no.(3)	Conc. in exp.no.(4)	Conc. in exp.no.(5)	average
Control	0.01	0.01	0.012	0.009	0.011	0.0104
Very close	0.26	0.22	0.22	0.20	0.24	0.22
Far in 10 m	0.19	0.24	0.21	0.19	0.20	0.18

Table (4) show Pb concentration (ppm) in *Ricinus sp*

distance	Conc. in exp.no.(1)	Conc. in exp.no.(2)	Conc. in exp.no.(3)	Conc. in exp.no.(4)	Conc. in exp.no.(5)	average

Control Very close Far in 10 m	0.04 0.14 0.11	0.035 0.13 0.12	0.05 0.16 0.13	0.039 0.11 0.1	0.04 0.1 0.1	0.04 0.128 0.112

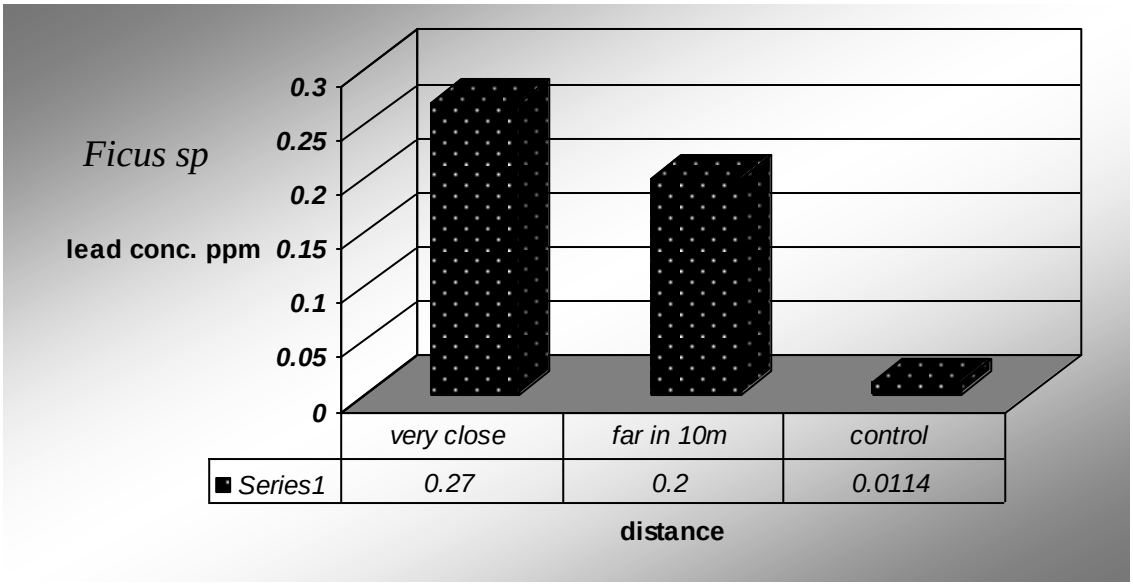

Diagram (1) show the relation between lead concentration and distance

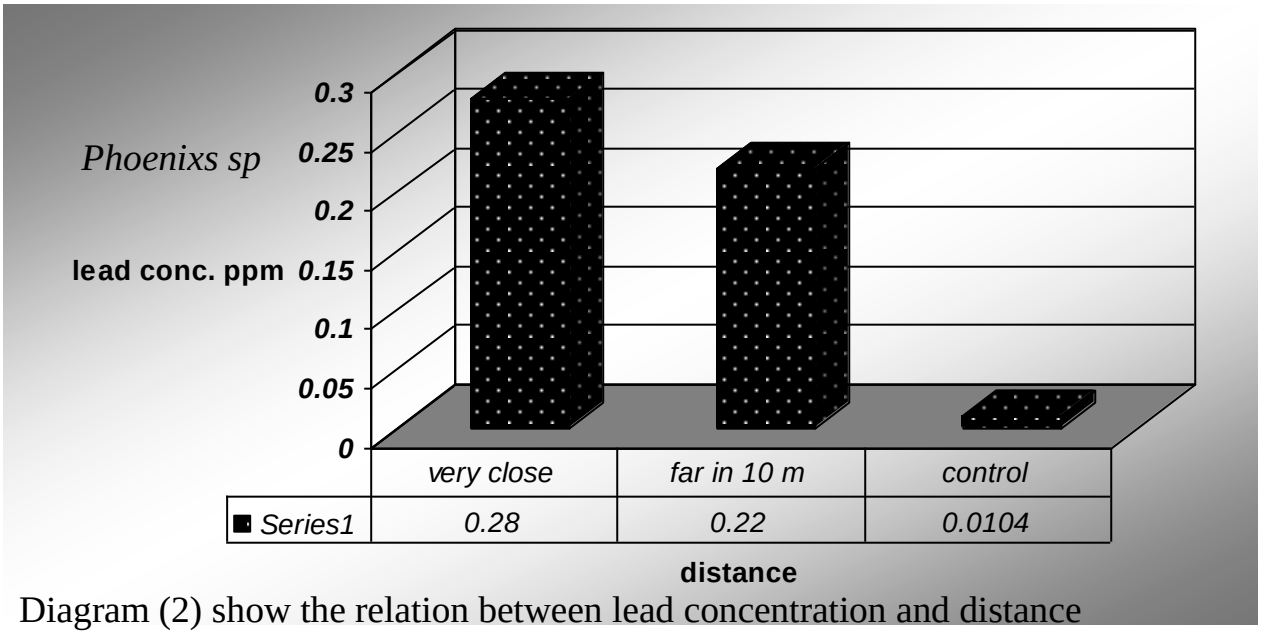

Diagram (2) show the relation between lead concentration and distance

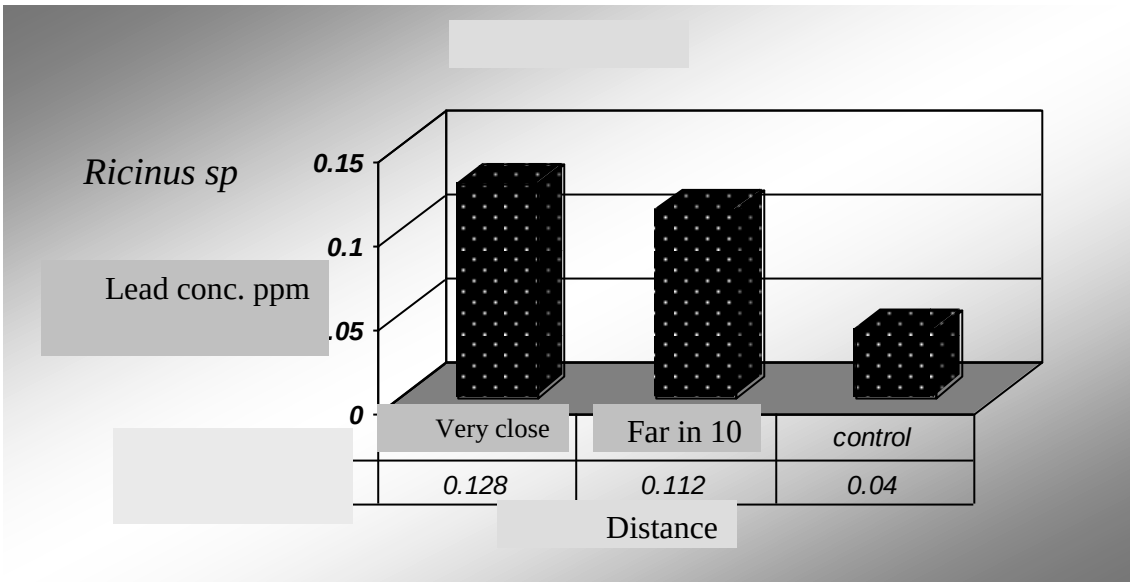

Diagram (3) show the relation between lead concentration and distance

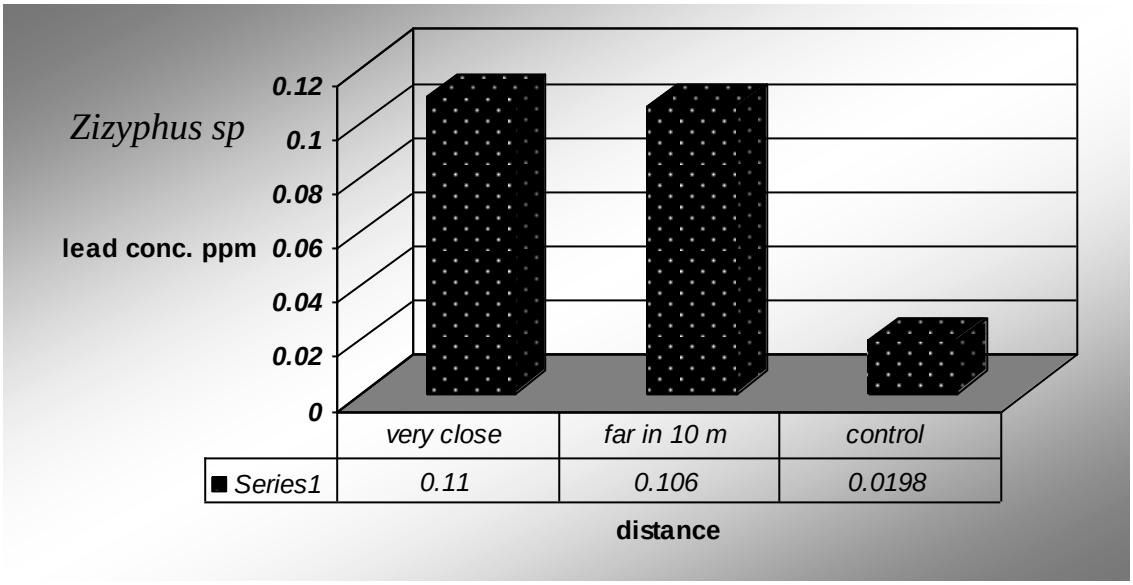

Diagram (4) show the relation between lead concentration and distance

Conclusion

Domestic power generators in Iraq not only essential source for electric power but also source for environmental pollution. The polluted leaves by smoke of power generator appear more pollution when it became closer to the source of pollution.

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