

## Tempo-spatial study of the deposition of lead on *Pinus eldarica*. (Medw). around the road side of Quetta city

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With increased automobile population the emission of pollutants have increased manifold in Quetta city. Lead is one of many pollutants present in automobile emissions. The objective of present study was to investigate the bioabsorption of lead in Quetta pine *Pinus eldarica* growing around different road side locations in Quetta city. Tempo-spatial distribution of Pb (lead) emitted from vehicular exhaust in relation to different aerial parts of *Pinus eldarica* found at road side in Quetta city, was analyzed up to six months without any interval at five different stations. It has been found that the Jinnah Road site is seriously affected and all the three replicates viz needles, bark and soil show greater concentration of lead as compared to other stations. A close perusal of data showed that Cantonment and Balochistan University Campus are least polluted while the Zarghoon Road and Sariab Road go parallel to each other. It has been noted that the higher concentration of lead is found in soil showing 325ppm in the month of November at Jinnah Road followed by leaves showing 266.66 ppm mean in the month of August and then bark showing 200 ppm as highest in the month of July.

**Key words:** Bioabsorption, Balochistan, heavy metal, lead (Pb),.

### Introduction.

Air pollution is multidimensional and complex in nature. There are many agencies causing air pollution. Burning of the fuel and waste of different kinds has resulted in the release of poisonous gases like sulphur dioxide, carbon monoxide, hydrogen sulphide etc. Urban centers of the countries are the main source of pollution.

Quetta city is spread over an area of about 32 sq kms with an approximate population of 1.2 million. There are about 82858 different types of vehicles registered in Quetta district whereas 65 to 70 thousand different kinds of vehicles from other parts of the country have reported arrival with Quetta registration authority, are also plying in Quetta city (Excise and taxation office Quetta).

In our country pollution from vehicles is due to the poor maintenance of engines, high loading factor and improper fuel and lube mixture and substandard silencers. Thus automobile exhaust causes air pollution. Pb (lead) is the principle pollutant in vehicular emissions. Lead emitted from automobile exhaust is deposited on surrounding objects and vegetation as

well. Lead deposited on different parts of plants and soil varies in concentration. The biggest amount of metals in the plant is found in roots then bark and leaves, the smallest amount in wood. (Johnson et al. 1983, Grestzta 1982, Harris 1981).

Keeping in view the traffic pressure and vehicular emissions in the Quetta city and its impact on exposed surrounding vegetation, in present study we have investigated the tempo-spatial deposition of lead i.e. variation in lead concentration as a factor of time and on *Pinus eldarica* which is planted at different sites around road side in Quetta city. The *Pinus eldarica* has been selected as an experimental tree as it is an evergreen tree and it bears needles throughout the year

### Materials and Methods

Five stations were selected for the study of lead concentration in *Pinus eldarica* found on roadside. Needles, Bark and soil samples were taken every month

from the selected stations. A brief introduction of study area is as under.

### 1. Sariab road.

The traffic pressure on Sariab road is greater than other roads of the city. Its average width is 11.2M, so at Village Aid we selected three *Pinus* trees for sampling purpose

### 2. Jinnah road.

At intersection with Shara-e-Iqbal on Jinnah road we selected trees for sampling due to its dense populated, heavy traffic pressure and closed nature.

### 3. Cantonment.

The area is considered less polluted to some extent as compared to other stations. Samplings were made from cantonment near Habib bank.

### 4. Zarghoon road.

The samples were taken from Zarghoon road near the Civil Secretariat.

### 5. University campus.

Campus was the fifth station for sampling purpose.

From above mentioned five stations selecting three trees of *Pinus eldarica* at each station, taking three replicates viz: needles, bark and soil, nine samples were taken from each station. Every month a total of 45 samples were analyzed for lead concentration using atomic absorption Spectrophotometer (AAS Varian specter AA-20). The sampling material i.e. needles, bark and soil was oven dried before investigation for Pb. concentration by Atomic absorption Spectrophotometer

### Chemical Analysis of Plant Material.

Plant samples were put in oven at 80°C for 72 hours. The dried plant material was then ground in kitchen blender. 0.5 gm of the samples was taken in crucibles and put in furnace at 550°C for four hours; the ash was then treated with 1 or 2 ml of concentrated Nitric acid ( $\text{HNO}_3$ ). The total volume was made 100 ml by adding of distilled water and filtered with the help of filter paper. This filtrate was once again filtered before analyzing it for lead concentration through Atomic Absorption Spectrophotometer (Varian Specter AA 20).

### Analysis of Trace Elements in Soil.

Soil samples were dried at 30-40°C for 24 hours in an oven and then sieved to pass mesh no.30 and 5 gm of each sample of soil was then extracted with 25% of Acetic acid. The solution was shaken for three hours on a reciprocating shaker extract were filtered with the help of Whatman filter paper No. 42. Replicate extractions were run on each sample and resulting extract assayed for Pb. through the Atomic Absorption Spectrophotometer AAS (Varian specter AA-20).

### Results and Discussion

#### Concentration of lead in plant Material

##### 1. Needles.

According to the Table no .1 the lead concentration in needles of *Pinus eldarica* in the month of July in Sariab road , Jinnah road and Zarghoon road show the same results i.e is 200 ppm, while Cantonment and Campus are in BDL (below detection level).

In August Jinnah road is evidently more polluted showing  $266.66 \pm 66.66$  ppm and the rest of 4 stations have no difference showing 200 ppm each.

In September some fluctuations occur and Jinnah road is again highly polluted showing 200ppm, then Sariab road having  $133.33 \pm 60.95$  ppm University campus and Zarghoon road show same results with  $66.66 \text{ mean} \pm 66.66$  while cantonment is in BDL .

In October Jinnah road and Zarghoon road show the same results with 200 ppm each. University campus and Cantonment:  $66.66 \pm 00$  ppm while the Sariab road is found in BDL.

In November all the stations were found in below deduction limit.

##### 2. Bark.

In July all the five stations were found in BDL. In August Jinnah road, Zarghoon road and University campus showed the same results with 133.33 ppm average. While the concentration in Cantonment, Zarghoon road and University campus was insignificant.

During the month of September the concentration of lead in bark samples recorded  $133.33 \pm 60.00$  ppm both at Sariab road and Jinnah road while Cantonment, Zarghoon road and University campus were found in BDL

In October Jinnah road site exhibited  $133.33 \pm 66.66$  ppm, Zarghoon road  $66.66 \pm 00$  ppm while in rest of three stations concentration is insignificant. . The lead concentration in November is throughout nil.

### 3. Concentration of lead in Soil.

Lead concentration in soil in the month of July is noted greater at Jinnah road showing  $166.66 \pm 6.66$  ppm, while Sariab road, Cantonment, Zarghoon road and University campus are  $26.66 \pm 6.66$ ,  $40 \pm 11.53$  ppm,  $40 \pm 11.53$  ppm, and  $46.66 \pm 13.33$  respectively.

In August Jinnah road again remained at top in terms of lead concentration showing  $166.40 \pm 6.66$  ppm while the Sariab road, Cantonment, Zarghoon road and campus showed  $46.66 \pm 13.33$  ppm,  $120 \pm 9.99$  ppm,  $93.33 \pm 26.38$  ppm and  $86.66 \pm 00$  ppm respectively.

In September Jinnah road showed  $133.33 \pm 66.66$  ppm, Zarghoon road  $106.66 \pm 22.17$  ppm, Cantonment  $60 \pm 11.54$ , Sariab road  $26.66 \pm 6.66$  and University campus contained  $20.00 \pm 11.54$  ppm.

In October Jinnah road exhibited  $156.66 \pm 17.63$  ppm, Cantonment.  $133.33 \pm 66.66$  ppm, Zarghoon road  $153.33 \pm 6.66$  ppm, University campus  $60 \pm 11.56$  and Sariab road exhibited  $40 \pm 0.00$  on average.

In November Jinnah road Contained  $325 \pm 45.06$ , Zarghoon road  $200.00 \pm 25.00$  Sariab road  $225 \pm 21.65$  university campus  $87.5 \pm 12.5$  and cantonment showed  $75.00 \pm 0.00$ .

Table 1. Lead (Pb) Concentration in ppm (Mean  $\pm$  SE) in needles of *Pinus eldarica* in different Months

S.No	Stations	Time in Months				
		July	August	September	October	Nov ember
1	Sariab Road	$200 \pm 0.00$	$200 \pm 0.00$	$133 \pm 60.94$	$0 \pm 0.00$	$0 \pm 0.00$
2	Jinnah Road	$200 \pm 0.00$	$266.66 \pm 66.66$	$200 \pm 0.00$	$200 \pm 0.00$	$0 \pm 0.00$
3	Cantonment	$0 \pm 0.00$	$200 \pm 0.00$	$0 \pm 0.00$	$66.66 \pm 66.66$	$0 \pm 0.00$
4	Zarghoon Road	$200 \pm 0.00$	$200 \pm 0.00$	$66.66 \pm 66.66$	$200 \pm 0.00$	$0 \pm 0.00$
5	University Campus	$0 \pm 0.00$	$200 \pm 0.00$	$66.66 \pm 66.66$	$133.33 \pm 66.66$	$0 \pm 0.00$

Table 2. Lead (Pb) Concentration (ppm) in Bark of *Pinus eldarica* in different Months

S.No	Time / Station	July Mean $\pm$ S.E	August Mean $\pm$ S.E	September Mean $\pm$ S.E	October Mean $\pm$ S.E	Nov ember Mean $\pm$ S.E
1	Sariab Road	$0 \pm 0.00$	$0 \pm 0.00$	$133.33 \pm 60.94$	$0 \pm 0.00$	$0 \pm 0.00$
2	Jinnah Road	$0 \pm 0.00$	$200 \pm 0.00$	$133.33 \pm 60.94$	$133.33 \pm 60.94$	$0 \pm 0.00$
3	Cantonment	$0 \pm 0.00$	$66.66 \pm 66.66$	$0 \pm 0.00$	$0 \pm 0.00$	$0 \pm 0.00$
4	Zarghoon Road	$0 \pm 0.00$	$200 \pm 0.00$	$0 \pm 0.00$	$66.66 \pm 66.66$	$0 \pm 0.00$
5	University Campus	$0 \pm 0.00$	$200 \pm 0.00$	$0 \pm 0.00$	$0 \pm 0.00$	$0 \pm 0.00$

Table 3. Lead (Pb) Concentration (ppm) in Soil

S.No	Time / Station	July Mean± S.E	August Mean± S.E	September Mean± S.E	October Mean± S.E	Nov ember Mean± S.E
1	Sariab Road	26.66±6.66	46.66±13.32	26.66±6.66	40±0.00	225±21.65
2	Jinnah Road	166.66±6.66	166.66±6.66	133.33±60.94	186.66±17.63	325±45.06
3	Cantonment	40±11.53	120±19.96	60±11.55	133.33±66.66	75±0.00
4	Zarghoon Road	40±11.53	93.33±26.31	106.66±22.17	153.33±6.66	200±25
5	University Campus	46.66±13.32	86.66±6.66	20±11.55	60±0.00	87.5±12.5

Results show that sample replicates consisting Needles and bark of *Pinus eldarica* and soil taken from five different stations situated along the roadside, exhibit fluctuation in lead concentration. Jinnah road is highly polluted area of the Quetta valley showing  $325 \pm 45.06$  ppm in soil in the month of November, which is the highest value recorded during our study period. As compared to other replicates soil contain more concentration of lead. In favor of our results the references of following authors can be made. (Banasova, 1983, Burton, et al. 1984, Greszta, et al. 1982, Khan, et al. 1983 Martin, et al.1982). Highest values recorded at Jinnah road are due to the congestion and more traffic pressure. Throughout the study duration lead concentration in soil at Jinnah road remained greater as compared to other four stations. The highest average value was obtained in the month of November i.e.  $325 \pm 54.06$  ppm second and third polluted areas of Quetta city are Sariab road and Zarghoon road having 150 ppm and 133.33 ppm respectively. While the cantonment and university campus are the least polluted area. But campus shows greater concentration than the cantonment. It is probably due to sewage water watering to the *Pinus eldarica* at university campus. As it is investigated by different authors that sewage effluent contain heavy metals including arsenic, antimony, cobalt, iron,

cadmium, zinc, lead etc. and it has a detrimental effect on the processes of self-purification of water reservoirs and on the operation of purification installation (Ashkinazi, et al 1983, , Hernus, et al. 1980). Tempo spatial variation in deposition of the lead has multidimensional aspects. Morphological features, wind velocity, vegetation density, soil pH, precipitation, congestion, distance from road, vehicular pressure, tolerance, soil texture and quantity of lead as gasoline additive affect the concentration of lead deposition. (Witkowski et al.1992, Jones, et al 1991, Majdi et al 1989, Clift et al.1983, Grestza 1982,Karataglis, et al. 1983, Johnsen et al 1983, Martin et al. 1982, Hurtle, 1981, Robel et al. 1981, Barbeau et al. 1981). If we compare the needles with bark, we see needles contain more concentration showing 266.66 ppm in the month of August at the site of Jinnah road. According to results bark show least concentration of lead as compared to other two replicates.

Tempo-spatial variation in deposition of the lead has multidimensional aspects. Morphological features, wind velocity, vegetation density, soil pH, precipitation, congestion, distance from road, vehicular pressure, tolerance, soil texture and quantity of lead as gasoline additive affect the concentration of lead deposition.

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