

Detect natural purification of mercury absorption in wells province of Sulaymaniyah - northern Iraq

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Abstract: In this research was detected from natural technique through follow elemental mercury in water samples from different heights from the bottom of the well of the city of Sulaymaniyah in northern Iraq and study of the relationship between it and two types of common plants common in same area, Four main sites from Mount (beerh micron) were selected from the wells of different heights of the well. Mercury concentrations were within acceptable limits, reaching Mercury concentrations in leaf plant *Ficus carica* higher concentration than *Juglans regia* . no more than allowable limits. No significant differences concentration of mercury in *Ficus carica* P value >0.5 in our study .Reaching there was no contamination in the region is not detected element in the plant for not concentration in the plant leaf is high and also focus relatively little in the artesian water upon which the villagers for drinking and domestic uses and Agriculture.



1. Introduction:

Sulaimaniyah province includes the north-eastern side of Iraq, between the province of Arbil from the north and north-west and west and is bordered by the province of Kirkuk, Salah al-Din province of the southwestern side and Diyala province from the southern side. study area is located between latitudes (32.34) and (31.36) in the north and longitude (32.44) and (36.20).[1,2]. Of groundwater basins, this lies within the borders of the province up to 9.798 km². Also there are groundwater basins are shared with neighboring provinces with Diyala, Salahuddin and Kirkuk and Arbil , Sulaymaniyah city witnessed the over the past years a large urban renaissance led to a significant increase in Population growth area in the city [3].

According to the Iraqi Ministry of Water Resources and the World Health Organization [4] the population in this region depends largely on hand-dug wells. Surface manifestations of groundwater aquifers are mainly represented by drilled wells. The groundwater occurrence and quality within the block strongly depends on the geology of the area. The prevalence plants in the region if natural spread plant different types of fruit and vegetables as *Juglans regia* and *Ficus carica* grows well in areas with a temperate. climate and winter warmth plantations

were established historically for both fruits and timber production.[5], In the summer, needs to be an atmosphere with moderate humidity , Most of the land suitable for planting, but the best growth is yellow alluvial land or rocky. Mercury is a highly toxic metal and come from a range of natural sources, mercury rich geological zones as well as from fresh water, lakes, rivers and the oceans [5,6] the important anthropogenic sources of mercury pollution in aquatic systems which are atmospheric deposition, erosion, urban discharges, agricultural materials, mining [7]. The research aims to evaluate the importance of groundwater in the province of Sulaymaniyah by the following:, There is no recent study of the elemental mercury concentration, especially in the groundwater of the area . Viability of the natural filtration of contaminants in water wells in the fact that the soil is rocky cover all parts of the region. The ability of the absorption of this element by which the most common plants by analyzing the mercury in water and leaf litter a broader and understanding of the contamination in it.

2. Materials and Methods

2.1 Sites Sampling

Prior to entering the field, sampling areas were determined on Mount (beerh micron) east of the city of Sulaimaniya to Mount Sordash ending at Dukan lake. Once in the field chosen sampling (Groundwater, two species plants) the most abundant in the study area, Sampling collection were recorded for each sampled along with the sample identification, date, time, weather, conditions, Was selected 4 main wells in this area if residents these villages uses well water for drinking purposes and Agriculture, Positioning the Mount to collect samples:

- (1) Artesian well in the village of (Bor Cardh) Far from mountain (beerh micron) 1km.
- (2) Away the Mount distance 2 km.
- (3) Away the Mount distance 3 km.
- (4) On the other side of the mountain 4 km.

2.2 Water Sampling

Water samples were collected by means of a van Veen grab sample from three replications of different depths down to the bottom for each station, Total samples taken from the location were 12 samples (three sample of each one station) and transported to the laboratory until being analyzed. Water samples were then collected in clean plain polyethylene containers. Prior to that, the polyethylene containers had been sterilized. The containers were thoroughly cleaned with 1:1 HNO₃ and rinsed several times with distilled water, then dried in electric oven. After this, the containers were completely filled with water before they were corked to avoid trapping of air bubbles. The samples were stored in a cool dry place before the commencement of laboratory analysis and Move to the laboratories of the Ministry of Science and Technology in Baghdad by preservatives chilled.

2.3 Leaf Plants Sampling

Leaf plants samples were collected in locations. Sampling, nitrite gloves were worn and samples were stored in Ziploc bags. Procedures using modified clean-hands/dirty-hands protocols wearing nitrite gloves followed for sample identification and data recording. Have been chosen two most common type of

leaf plant the most presence in the same location three replications to get 6 samples of leaf plants selected for the study:

- *Juglans regia* L-Jr from the family Juglandaceae
- *Ficus carica* L-Fc from the family Moraceae

2.4 Mercury Analysis

Samples were analyzed with a DMA 80 M (Direct mercury analyzer Milestone) determines total mercury within one standard deviation of certified values which heats samples in a reagent matrix to 850 °C and measures the gaseous mercury vaporized in the process. Our analysis used a high calibration curve for all measurements. Quality assurance was done by the analysis of samples in triplicate (i.e., triplicate analysis of each original triplicate sample that was collected) the inclusion of blanks, certified reference materials, as well as by doing a standard calibration run using matrix-matched standards. Procedural blanks were run along with matrix-matched standards with each analytical batch to determine analytical accuracy. The percentage recoveries of the water and leaf plant standards were between 65%-88% and 77%-85%, respectively, It is the closest percentages were obtained with the rest of the tests. Quality control of the analysis was verified by the routine analysis of the following certified reference materials: CNS392-050 for metals in water, IAEA-405 for Hg in leaf plant.

2.4 Statistical Analysis

Statistical analysis of the Hg results was performed using one-way analysis of variance and Sigmaplot. Test of equality of variance showed equal variance ($P > 0.05$), linear regression analysis was used to determine any significant correlations between leaf plants and Hg in ground water concentrations.

3: Results and Discussion

3.2 Mercury Concentrations in Leaf Plants:

The results were obtained mean of the replicates mean mercury concentrations ranged of (1.93 -0.21) (0.94 -0.11) ng² in *Ficus carica* .>*Juglans regia* Respectively because leaf *Ficus carica* a wide as well as on more height *Juglans regia*, the most susceptible to pollution in the

atmosphere is relatively little in the study area for that ability absorption mercury from soil and irrigation water did not affect the increase in the concentration of this element, Comparing our mercury results to other studies we see lower concentrations to the study [10] .No significant differences concentration of mercury in Ficus carica P value >0.5 in our study is likely due to the cumulative nature of the sample type relative to the other leaf parts analyzed compared with Juglans regia (Table 2 , Fig 2) shows the correlation between mercury concentration in leaf plants in station under the study.

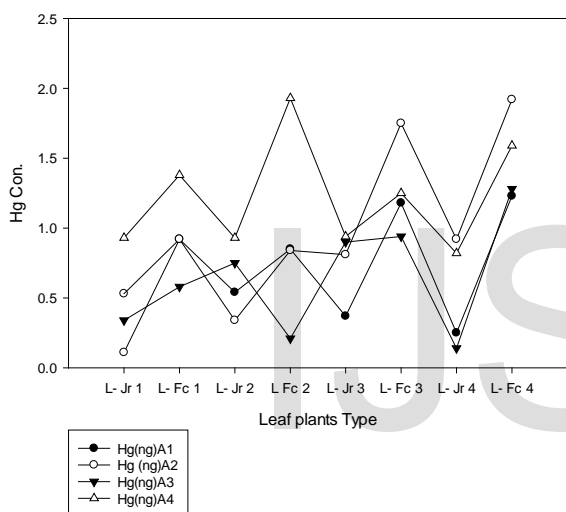


Fig 2: shows the correlation between mercury concentration in leaf plants in station under the study.

3.1 Mercury Concentrations in Ground water:

Given the results that have been obtained total mercury concentrations in water samples generally low percentages between (1.65- 0.85) (ng)2 Respectively compared other studies [8,9] may be due of the nature mountainous area collected samples and seepage rain falling and water filtration in depressions and filtration separates contaminants from water during the passage water through a semi-permeable barrier . This allows some is constituents to pass according to nature stone to the ground surrounding the well of the study area. This refers water treatment technologies by wells precipitation is the most commonly used process to treat mercury-contaminated water. The effectiveness of this

technology is less likely to be affected by characteristics of contaminants. The results shows mercury in groundwater has migrated down gradient, No mercury was detected in surface water at nearby bodies of water, concentrations mercury which seems to be compatible with the results acquired with WHO and Iraqi Ministry of Water Resources. Most of the villages within the limestone area rely on drilled wells. Groundwater wells are generally less than 50-100m deep. The cause of these less parameters may be of natural origin or from local domestic sources.

The concentration of elemental mercury between examined there are no significant differences between ground water with varying leaf plant species. Afew percentage may be due to contamination, which could have been the emissions from fuel oil used to electric generators, equipped with electric power during power outages in this region. correlation between mercury (ng)2 in ground water and percent Leaf plants results from samples collected under the study area as follows (A1Gw) Percentage (0.93 _ 1.63) %respectively (L-Jr% L-Fc%) and (A4 Gw) Percentage (0.88_ 0.94) % respectively (L-Jr% L-Fc%). Table (1) correlation between mercury (ng)2 in Ground water and percent Leaf plants (%) results from samples collected under the study area .

Name Site	Sovl(mg)2	Hg(ng)2	L-Jr %	L-Fc%
A1Gw	10	1.33	0.93	1.63
A2 Gw	5.9	0.85	0.33	1.03
A3 Gw	5.7	1.38	0.29	0.67
A4 Gw	6.3	1.65	0.88	0.94

Table (1) correlation between mercury (ng)2 in Ground water and percent Leaf plants (%) results from samples collected under the study area

4: Conclusions

Reaching there was no contamination in the region is not detected element in the plant for not concentration in the plant leaf is high and also focus relatively little in the artesian water upon which the villagers for drinking and domestic uses and Agriculture .This refers to their suitability for other use as building and construction. Even

though any a few percentages are caused by electrical station or domestic which do not affect negatively on nature there .Therefore we recommend must systematic study of other elements Especially those that affect human health concentrations in groundwater sources in the area should be carried out regularly to safe guard.

ACKNOWLEDGMENT

Following are acknowledged for ideas, comments, and other assistance which contributed to this paper: Labs in the Ministry of Science and Technology also gratefully acknowledged to Dr.Reyam Najj Ajmi to assist in the provision of this publication.

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Leaf Plant	Mercury(ng)A1	Mercury(ng)A2	Mercury(ng)A3	Mercury(ng)A4
L- Jr 1	0.53	0.11	0.34	0.93
L- Fc 1	0.92	0.92	0.58	1.38
L- Jr 2	0.54	0.34	0.75	0.93
L Fc 2	0.85	0.84	0.21	1.93
L- Jr 3	0.37	0.81	0.90	0.94
L- Fc 3	1.18	1.75	0.94	1.25
L- Jr 4	0.25	0.92	0.14	0.82
L- Fc 4	1.23	1.92	1.28	1.59

Table 2 :shows the correlation between mercury concentration in L-Jr : Leaf Juglans regia leaf plants in station under the study

L-Fc : Leaf Ficus carica

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