Data Article

Data of heavy metals in soil and groundwater at Kiwi gardens of Amlash in Guilan Province, Iran

Dariush Naghipour a, Seyed Davoud Ashrafi a,b, Kamran Taghavi a,*

a School of Health, Guilan University of Medical Sciences, Rasht, Iran
b Research Center of Health and Environment, Guilan University of Medical Sciences, Rasht, Iran

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A B S T R A C T

Data on this paper describe the concentrations of arsenic, cadmium, copper, nickel, lead and zinc in the surface soils and groundwater's of Kiwi gardens and its relation to chemical fertilizers in Amlash city, Guilan Province, in Iran. The results of this study showed that the average concentration of heavy metals in groundwater and soils of the studied areas was less than the national standards of Iran for irrigation water, Dutch MPA for soils (except Cu and Ni) and Canadian MAC for inorganic fertilizers. Considering that after fertilizing to soils used in gardening, the concentration of heavy metals in groundwater and soil can be increased significantly, so that chemical fertilizers can be considered as an effective factor in increasing the amount of heavy metals in water and soil. The results of this research can be used by who concern about water and soil quality related to fertilizing and also can be used by Rural Water and Wastewater Company and Ministry of Jahad Agriculture of Iran.

* Corresponding author.
E-mail address: k.taghavi@gums.ac.ir (K. Taghavi).
### Specifications table

| Subject area                  | Environmental Sciences                                      |
|-------------------------------|------------------------------------------------------------|
| More specific subject area    | Heavy metals in ground water soil and fertilizer           |
| Type of data                  | Figure and table                                           |
| How data was acquired         | As, Cd, Cu, Ni, Pb and Zn measurements were carried out by ICP-OES – Spectro (Model ARCOS FHE12, Germany) based on standard procedures [1]. Samples of this study were prepared and analyzed from rural ground waters, soils and fertilizers. Digital pH meter (Metrohm) was applied for pH regulation after digestion for sample preparations. |
| Data format                   | Raw, analyzed                                              |
| Experimental factors          | The data were obtained in two season, spring and summer, and pH was measured in field, and for heavy metals analyzing the samples in poly-ethylene bottles were stored in a dark place at 4 °C temperature until the analysis [1]. |
| Experimental features         | As, Cd, Cu, Ni, Pb and Zn were determined and compared with Iranian standards for irrigation water, Dutch MPA for soils and Canadian MAC for inorganic fertilizers [2–4]. |
| Data source location          | Amlash, Guilan Province, Iran.                             |
| Data accessibility            | The data are available within this paper.                  |

### Value of the data

- The results obtained from this research can be used by the Food and Drug Administration, Iran’s Gardening Department.
- The results of this research can be used by Rural Water and Wastewater Company and Ministry of Jahad Agriculture of Iran.
- The results of this research can be used by the Iranian Environmental Protection Agency, Ministry of Health for human health risk assessment of Gardening products.

### 1. Data

Environmental pollution like drinking water and soil pollution by organic and inorganic materials is one of the most important issues in the world [5–16]. Before fertilizing the fruit gardens, average concentration of Cd, Cu, Ni, Pb and Zn in groundwater samples was 0.185, 0.579, 3.407, 0.238 and 2.490 µg/l, respectively, but, after the fertilization the mean concentration increased to 0.216, 0.717, 5.435, 0.435 and 4.652 µg/l, respectively. It should be noted that the amount of As in groundwater samples was not detectable due to the accuracy of the device. The average pH of well water in the samples was 6.9. The concentration of heavy metals in groundwater samples before and after fertilization is presented in Table 1. The concentration of heavy metals studied in well water samples, in both sampling stages was lower than the national standards of Iran for irrigation [2].

Before the fertilization, the mean concentration of As, Cd, Cu, Ni, Pb and Zn in soil samples was 0.517, 0.066, 18.386, 10.151, 13.091 and 39.745 mg/kg, respectively, but, after the fertilization the mean concentration was 0.273, 0.085, 25.048, 14.555, 16.226 and 52.186 mg/kg, respectively. The concentration of heavy metals studied in soil samples in both sampling stages was lower than the Dutch MPA for soils [3]. According to the soil texture analysis in the region, the average soil pH was 6.5. The concentration of metals in soil samples before and after fertilization is presented in Table 2.
The concentration of heavy metals in five fertilizers used in kiwi gardens is presented in Table 3. The Average concentration of heavy metals in fertilizer samples was lower than the Canadian MAC standards (except for Zn) [4].

Average of five highly used fertilizers of Kiwi Gardens in 7 villages in Amlash is presented in Table 4, and showed that urea, triple super phosphate, potassium sulfate, zinc sulfate and full fertilizer in the Kiwi gardens were 420, 380, 200, 90 and 75 kg/yr.

2. Experimental design, materials and methods

2.1. Study area description

The study area is located in the east of Giulan, Amlash city, 75 km from Rasht, the center of the province. According to the last census of Statistical Center of Iran at 2017 the population of the city of Amlash has been declared to be 43,225 people. The studied area is under cultivation of fruit gardens, which is about 20 ha. These gardens are located in 7 villages called Chamanestan, Nerke, Hardoab, Legmog, Balange, Holosara and Azarin. Sampling zone and point of this research was presented in Fig. 1.

2.2. Sample collection and analytical procedures

Samples collected at 21 stations from wells and soils of Kiwi gardens before and after adding fertilizers (Urea, triple superphosphate, potassium sulfate, zinc sulfate and full fertilizer). Data obtained with two methods which were questionnaire and analyzing. Questionnaires were provided to farmers in order to obtain information about the type, amount, manner of fertilizer use, and area of cultivation for kiwi gardens. The distribution of fertilizers was collected from the Jahad Agricultural
Organization and the fertilizer distribution cooperatives, and the fertilizers were purchased from its supply stores. In water sampling of wells as a source for irrigation of the farms, samples took from well discharge. However, in fields where their irrigation water were supplied from various sources, such as springs and rivers, especially during well dehydration, the samples were prepared in a composite form. After filtering well water (with Whatman filter 42) and condensation process at 90°C in polyethylene bottles, samples labeled. Then, with 1 ml of concentrated nitric acid, pH of samples decreased to less than 2. The samples were transferred to the laboratory using ice bag and kept in the refrigerator [1]. In soil sampling, samples were collected at the stations designated by the combined

### Table 2

Heavy metal concentrations in soil samples before and after fertilization in Kiwi Gardens, Amlash City in 2017 (mg/kg).

| Number of samples | As     | Cd    | Cu     | Ni    | Pb     | Zn     |
|-------------------|--------|-------|--------|-------|--------|--------|
| before            | after  | before| after  | before| after  | before |
| 1                 | ND     | 0.680 | 0.020  | 0.120 | 28.580 | 35.970 |
| 2                 | 0.007  | ND    | ND     | 17.680| 19.730 | 8.860  |
| 3                 | ND     | ND    | 0.050  | 14.900| 37.030 | 9.890  |
| 4                 | ND     | ND    | 24.660 | 35.740| 6.390  | 13.880 |
| 5                 | 0.300  | ND    | 0.004  | 19.050| 23.490 | 9.330  |
| 6                 | ND     | ND    | 0.002  | 23.250| 23.400 | 11.900 |
| 7                 | 0.090  | ND    | 0.310  | 8.070 | 42.25  | 16.450 |
| 8                 | 0.130  | ND    | ND     | 24.580| 26.380 | 12.250 |
| 9                 | ND     | ND    | 0.04   | 20.850| 24.410 | 10.09  |
| 10                | ND     | ND    | 0.001  | 16.440| 24.200 | 10.600 |
| 11                | 0.140  | ND    | ND     | 17.420| 25.710 | 10.03  |
| 12                | ND     | ND    | 20.930 | 23.110| 10.290 | 24.280 |
| 13                | ND     | ND    | 21.890 | 24.850| 14.200 | 16.360 |
| 14                | 0.780  | ND    | 0.340  | 4.240 | 16.670 | 8.270  |
| 15                | 0.600  | ND    | 0.130  | 14.180| 16.410 | 9.850  |
| 16                | 0.500  | ND    | 18.090 | 20.050| 8.900  | 11.910 |
| 17                | ND     | ND    | 22.490 | 22.990| 11.870 | 16.780 |
| 18                | 0.72   | ND    | ND     | 20.180| 21.600 | 9.500  |
| 19                | 1.260  | 0.090 | 0.050  | 14.03 | 21.900 | 7.110  |
| 20                | 1.16   | 0.050 | ND     | 0.050 | 17.030 | 17.510 |
| Average           | 0.517  | 0.273 | 0.066  | 0.085 | 18.386 | 25.048 |
| Min               | 0.007  | 0.050 | 0.020  | 0.001 | 3.420  | 14.670 |
| Max               | 1.260  | 0.680 | 0.130  | 0.310 | 28.580 | 42.250 |
| S.D               | 0.431  | 0.352 | 0.056  | 0.098 | 5.790  | 7.280  |

The Dutch MPA for soils

| Parameters       | As     | Cd    | Cu     | Ni    | Pb     | Zn     |
|------------------|--------|-------|--------|-------|--------|--------|
| Urine            | 0.668  | 0.027 | 0.642  | 12.100| 1.220  | 8.770  |
| Triple superphosphate | 9.060 | 0.013 | 5.260  | 9.130 | 1.650  | 7.030  |
| Potassium sulfate | 0.160 | 0.078 | 0.601  | 13.940| 0.420  | 1570.950|
| Zinc sulfate     | 0.118  | 3.530 | 0.524  | 66.050| 2.554  | 28592.300|
| Complete         | 1.137  | 0.047 | 4.086  | 13.203| 0.420  | 610.700|
| Average          | 2.228  | 0.739 | 2.222  | 22.884| 1.252  | 1017.950|
| SD               | 3.841  | 1.560 | 2.275  | 24.199| 0.899  | 1227.319|
| Min              | 0.668  | 0.013 | 0.524  | 9.130 | 0.420  | 7.030  |
| Max              | 9.060  | 3.530 | 5.260  | 66.050| 2.554  | 28592.300|
| Canadian MAC     | 75     | 20    | –      | 180   | 500    | 1850   |
method. Samples of surface soils were prepared at a depth of 0–20 cm and mixed together and shaking in the laboratory for one hour. Soil samples were mixed with distilled water at a rate of 2.5:1 in the laboratory. Then the pH of the mixture was measured using pH meter. Preparation of fertilizer samples was done as well as soil samples [17].

To prepare a fertilizer sample, 5 fertilizers were selected for harvesting fruit gardens and from each kind of fertilizer 3 different brands were prepared on the market and each brand was harvested with equal ratio and mixed together and finally 5 fertilizer samples (sample weight; 1 Kg), were prepared and tested. Digestion of soil and fertilizer samples were carried out using nitric acid and concentrated hydrochloric acid of Merck Germany and deionized distilled water. Heavy metals of samples were digested with a mixture of three parts of hydrochloric acid and one nitric acid fraction. All samples, prepared, digested and measured according to standard methods [1,18].

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### Table 4:
Average of five highly used fertilizers of Kiwi Gardens, Amlash City in 2017 (kg/yr.).

| Name of village | Urine | Triple super-phosphate | Potassium sulfate | Zinc sulfate | Full fertilizer |
|-----------------|-------|------------------------|-------------------|-------------|----------------|
| Balangheh       | 27    | 32                     | 15                | 5           | 15             |
| Hardoab         | 33    | 28                     | 25                | 10          | 5              |
| Tarkeh          | 45    | 42                     | 20                | 12          | 17             |
| Azarin          | 64    | 58                     | 35                | 10          | 10             |
| Lagnoj          | 73    | 64                     | 28                | 13          | 8              |
| Holosara        | 80    | 73                     | 32                | 20          | 10             |
| Chamanestan     | 98    | 83                     | 45                | 20          | 10             |
| Total           | 420   | 380                    | 200               | 90          | 75             |

Fig. 1. Sampling zone and point of research, Amlash, Guilan Province.
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Transparency document. Supplementary material

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2017.09.054.

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