

A Comparative Study of Quality Parameters of Water and Soil Samples from Automobile Workshop Areas at Kumbakonam, TN, India

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Available online at: www.isca.in, www.isca.me

Received 1st March 2016, revised 9th May 2016, accepted 8th June 2016

Abstract

Water and soil is the most important natural resources for human being. The water and soil may be affected due to the large growth of natural (decomposed vegetables and animals, etc.,) and anthropogenic processes (Industrial, Agricultural, Domestic, Pesticides, etc.,) in the study areas. In the present studies were assessed to compare the quality parameters of water and the corresponding soil samples collected from the automobile work shop areas at Kumbakonam. The soil and water samples were analyzed by the quality parameters viz., Temperature, pH, Total hardness (TH), Total alkalinity, Electrical conductivity (EC), Total dissolved solid (TDS) and Dissolved oxygen (DO). The heavy metals such as Iron and Lead for the water and soil samples were also to be carried out and compare with the standards. The results indicate that all the parameters slightly deviate from the standards given by the WHO and EPA.

Keywords: Kumbakonam, Automobile shop, Physico-Chemical parameters, Iron, Lead.

Introduction

Water is one of the important and most abundant compounds in the eco system¹. It is essential to the man and all living organisms. The ground water is used for the agriculture, industrial, domestic and environmental activities². The ground water may get polluted because of the disposal of industrial effluents, sewage, hazardous waste, pesticide, fertilizer and automobile parts³⁻⁶ to the soil. The quality parameters of water and soil samples are very important. The main investigation of this paper is to compare the quality parameters (Temperature, pH, Total hardness (TH), Total alkalinity, Electrical conductivity (EC), Total dissolved solid (TDS), Dissolved oxygen (DO), Iron and Lead) for soil and water samples especially from automobile shop areas at Kumbakonam.

Materials and Methods

About the Study area: The study area is located in Kumbakonam at Thanjavur district in the south East Indian state of Tamil Nadu. The latitude 10° 58' 0" N and the longitude 79° 23' 0" E. Kumbakonam is one the most famous temple city.

Methods: Water and the corresponding soil samples were collected from automobile shop areas of Kumbakonam. Ground water sample was collected by using precleaned sterile polythene 1000 ml bottle. The temperature of the water and soil samples were measured on the spot, the soil sample was collected by using polythene air tight cover. The collected water and soil samples are tightly closed without the entry of foreign substance. The physico-chemical parameters, iron and lead were studied using standard procedure.

Physico-chemical studies⁷⁻⁸: For heavy metal analysis, the one liter of water sample was acidified with concentrated nitric acid.

Assessment of heavy metals⁹⁻¹⁰: One liter of water was filtered through a Whatman No.41 filter paper and adjusted to pH 2 with HNO₃ taken in a separatory funnel. The 10 ml (3% w/v) of a freshly prepared solution of amino-pyrolidine dithiocarbamate (APDC) was added into the funnel, and the mixture was shaken by a mechanical shaker for 10 minutes. Further, 25 ml of methyl-isobutyl-ketone (MIBK) was added to this mixture and shaken for 15 minutes. The phases were allowed to separate. The top organic phase was collected and was mixed with 2 ml of 50% HNO₃, and shaken vigorously for 10 minutes to separate the bottom acid layer.

Table-1
Standard methods

| Parameters | Methods |
|------------------------------|-----------------------------|
| pH | pH meter |
| Electrical conductivity (EC) | Digital Conductivity meter |
| Total dissolved solids (TDS) | TDS Meter |
| Total alkalinity (TA) | Standard method |
| Total hardness (TH) | Standard method |
| Dissolved oxygen (DO) | Winkler's Iodimetric Method |

Results and Discussion

pH is an important index of acidity and alkalinity¹¹. In the study areas the pH value of water sample is 8.34 and soil sample is 7.85 which indicate the alkaline character. The electrical conductivity in the study area (water 278.5µS/cm, soil 497.6 µS/cm) were found at higher electrical conductivity values indicate the total ionic composition of water and soil samples. Comparative quality parameters of water and soil samples have been shown in Table-1¹².

The total dissolved solid values of water sample is 435mg/l and the soil sample is 790mg/l. according to WHO standard the TDS is <300 mg/l is excellent, 300-600 mg/l is good, 600-900 is fair from this data the water sample is good and soil is fair¹³. Total alkalinity was measured for water sample is 75.4mg/l and the soil is 176.9mg/l. Total hardness values of both samples not exceed the desirable limits given by WHO¹⁴.

The Dissolved Oxygen is a measure of oxygen gas present in the water. Plant and animals cannot directly use the oxygen that is part of the water molecule. Levels of dissolved oxygen vary depending on factors including water temperature, time of day, season. At higher temperatures the water has low DO. 0-2mg/l not enough to support life and 4-7mg/l is good for aquatic plants and animals. In the present samples the DO level is within the limit¹⁵.

Iron: Iron is the most important and also most abundant metal to man. It exist 4.5% in earth crust. All the plants, animals, bacteria use iron. The soluble ferrous iron is oxidized in air to the insoluble ferric form, resulting in colour or turbidity of the water changes. The iron is normally no harmful with significance amount which is exceed it can cause severe problems. In the present water and soil samples the iron values

are 0.42(mg/l) and 0.84(mg/l) which is slightly exceed in the limits (0.5mg/l) due to automobile parts poured in to the soil without the precautions¹⁶.

Lead : Lead is one of the toxic heavy metals. It accumulates in the soil from industrial, e-waste, automobile parts, etc., it is not occur in nature. Lead toxicity is the major problems of gastrointestinal, kidney and neurological effect¹⁷. In the present soil samples the lead value is in the range of 0.18mg/l which is exceed the limits given by WHO (0.01mg/l). Lead poison is removed by the chelation therapy using EDTA.

Table-2
Comparative quality parameters of water and soil samples

| Parameters | Water sample | Soil sample |
|-----------------|--------------|-------------|
| Temperature(°C) | 30 | 31 |
| pH | 8.34 | 7.85 |
| EC (µS/cm) | 278.5 | 497.6 |
| TDS (mg/l) | 435 | 790.24 |
| DO(mg/l) | 4.8 | 5.8 |
| TA(mg/l) | 75.4 | 176.9 |
| TH (mg/l) | 31.6 | 38.8 |
| IRON (mg/l) | 0.42 | 0.84 |
| LEAD (mg/l) | 0.08 | 0.18 |

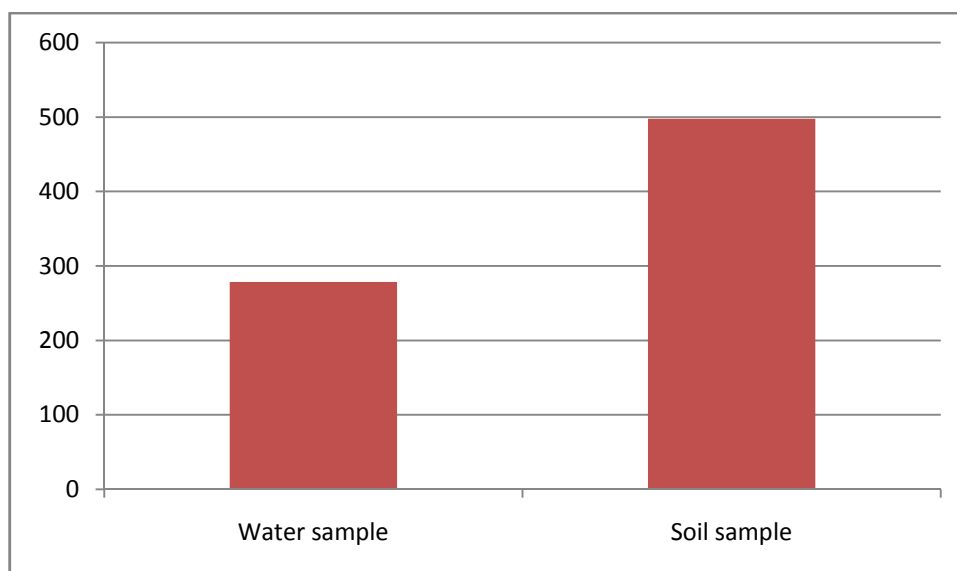


Figure-1
Correlation of Electrical conductivity of water and soil samples

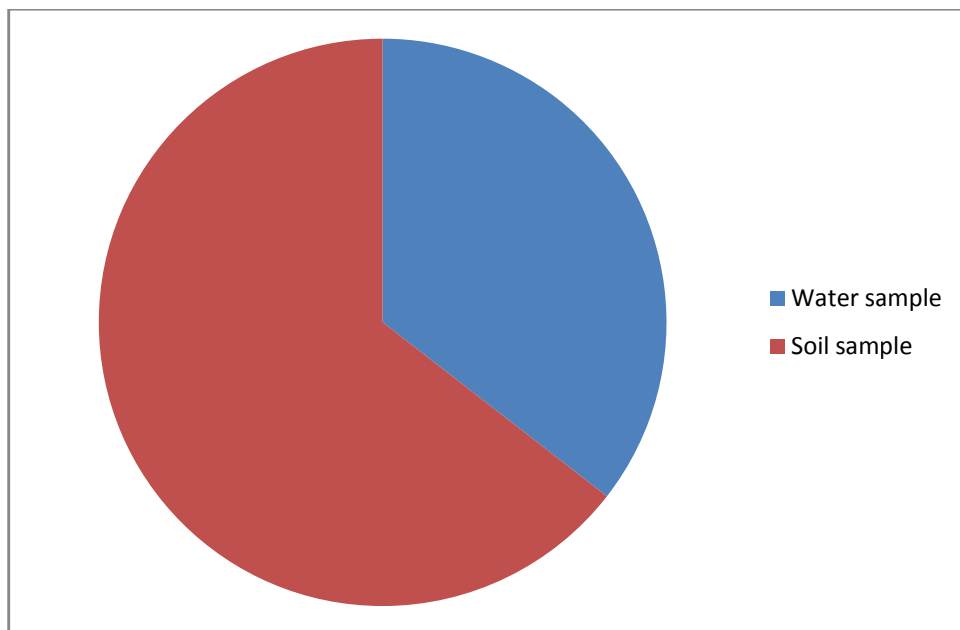


Figure-2
Correlation of Total dissolved solid of water and soil samples

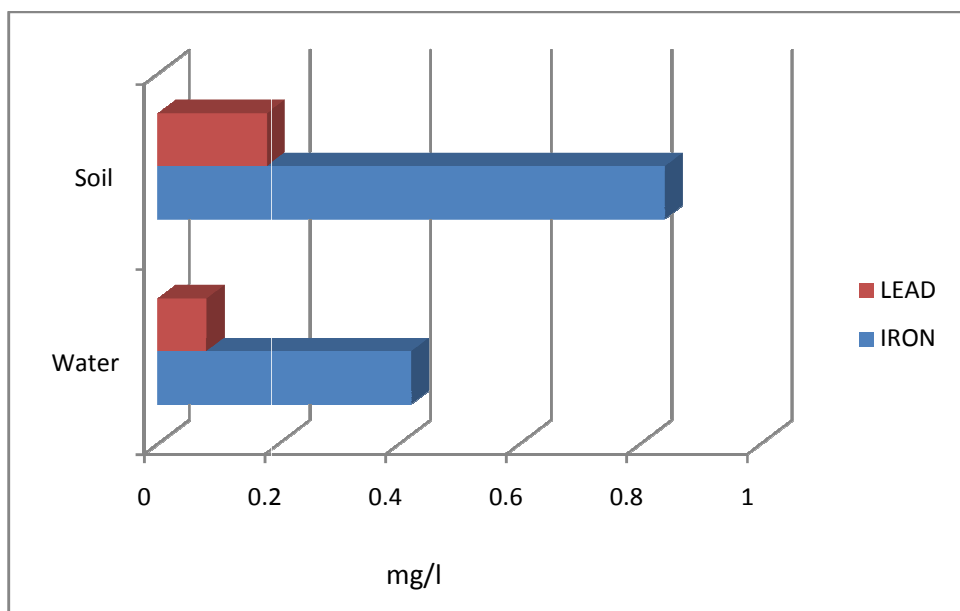


Figure-3
Heavy metals of water and soil samples

Conclusion

The present studies conclude the comparison of soil and the corresponding water samples by pH, Temperature, alkalinity, EC, TDS, TH and DO parameters. The heavy metals especially lead and iron were also analyzed the results indicating, all the parameters value exceed the desirable limits except total hardness. Heavy metals are very dangerous for human.

To control soil pollution avoids the use of polythene, plastic, e-waste and wastage parts from automobile shop. Control the heavy metal pollution in soil by solid waste management. Increasing ground water by harvesting rain water also reduces the heavy metal pollution of soils. Proper treatment of E-waste in electronic and electrical store and also automobile parts may reduce the pollution of soil from heavy metal contamination.

Proper management will also carried out in soil that will manage the quality of ground water.

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