



SEASONAL VARIATION OF HEAVY METAL ANALYSIS OF GROUND WATER IN AND AROUND SENTHURAI TALUK IN ARIYALUR DISTRICT – TAMILNADU.

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Abstract:-

A Total 16 ground water samples were collected in and around sendurai taluk in Ariyalur district during pre-monsoon, monsoon and post-monsoon seasons and analyzed in order to find out pollution impact. The heavy metal analyses Cu, Zn, Ir, Pb and Ni were determined using atomic absorption spectrophotometer and the results were compared with the World Health Organization (WHO 2011) Standard Values. The heavy metal ions are toxic to human health. This study suggests that the preventive measures which are to be adopted to control the contamination of excess Lead and Nickel present in the water.

Key words:- Groundwater, Heavy Metal, Seasonal Variation.

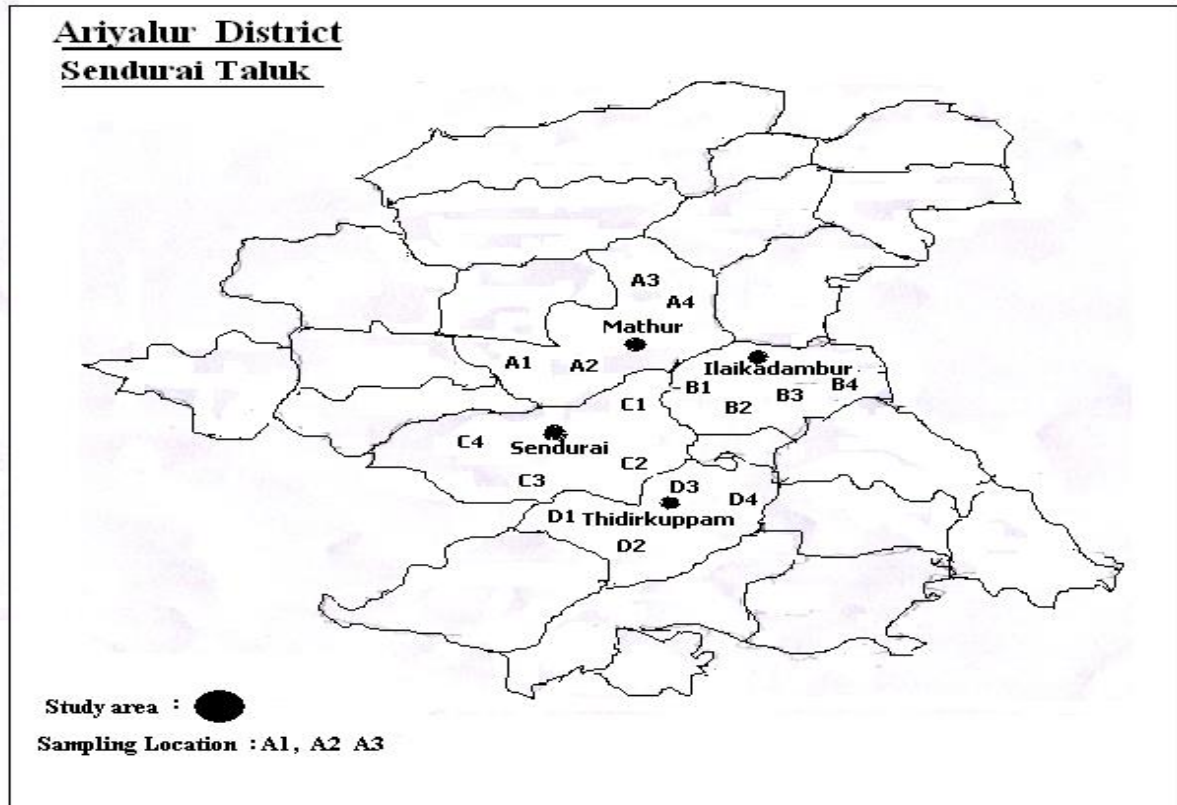
Introduction

Water is the most common liquid on Earth. It covers about 71.4% of the Earth ⁽¹⁾. Pure water has no smell, taste, or colour. Lakes, oceans and rivers are made of water. Water is very important for life⁽²⁾ However, some studies suggest that by 2025 more than half the people around the world will not have enough water ⁽³⁾. In all its use, quality and quantity are the most important terms to consider. Human activities such as industrial production, mining, Agriculture and transportation, release high amounts of heavy metals into surface and groundwater, soils and ultimately to the biosphere. The heavy metals are present in both surface water and ground water.⁽⁴⁾ Heavy metals are important environmental pollutions and their toxicity is a problem of increasing significance for ecological, evolutionary and environmental reasons Heavy metals are also considered as trace elements because of their presence in trace concentrations in various environmental matrices. Their bioavailability is influenced by physical factors such as temperature, phase association, absorption and sequestration. It is also affected by chemical factors that influence speciation at thermodynamic equilibrium, complication kinetics lipid solubility and octanol/water partition coefficients. Biological Factors such as species characteristics, trophic interactions, and biochemical physiological adaptation, also play an important role. Heavy metals are playing a vitalrole in the normal functioning of body. But their in excess than the permissible limit may harms to the vital function of the organs. The main source for the heavy metal entry in to the human body is through water resources. The main objective of this study was to quantity the selected heavy metals (Cu, Zn, Fe, pb, Ni) From ground water sources at Senthurai Taluk at Ariyalur District on the heavy metal contamination of ground water sources.

Study Area

. Sendurai Taluk is a Taluk of Ariyalur District of the Indian State of Tamilnadu. The sendurai village has a population of 9643 of which 4817 are males while 4826 are females as per population census 2011. The sendurai taluk region fairly rich in limestone deposits. Lime stone is an important ingredient for cement manufacturing. Cement industries like RSamco and ICL are located in this area. The people of this area have depending only on the ground water as the main source for drinking purpose and other purposes. The objective of the present work is to discuss the Heavy melals of groundwater in and around Sendurai Taluk.

Fig: 1 LOCATION MAP OF THE STUDY AREA



Materials and method

The heavy metals analysis for the groundwater samples are performed during Premonsoon, Monsoon and Post monsoon seasons. (April – 2015 to December 2015). The groundwater samples were collected from different location including bore water and wells. In different seasons water samples were collected at various stations such as Mathur (A1 to A4) 2. Ilaikadambur (B1 to B4) 3. Sendurai town (C1 to C4) 4. Thidirkuppam (D1 to D4). The water samples were collected in (2 liter bottle) which had been thoroughly washed and filled with distilled water and then taken to the sampling site. The bottles were emptied and rinsed several times with the water to be collected. The sample bottles were highly covered immediately after collection and the temperature was taken. The heavy metal such as Cu, Zn, Fe, Pb and Ni were determined using atomic absorption spectrometer and the results were compared with WHO standard values (2011).

Results and Discussion

Table : 1 Heavy metal analysis of groundwater samples collected around Ariyalur district in the month of May 2015(premonsoon)

Station	Cu	Zn	Fe	Pb	Ni
A1	0.7	0.05	0.11	0.02	0.7
A2	0.6	0.04	0.12	0.03	0.6
A3	0.6	0.03	0.13	0.04	0.9
A4	0.5	0.03	0.11	0.03	0.8
B1	0.3	0.12	0.15	0.03	0.11
B2	0.4	0.11	0.17	0.04	0.10
B3	0.4	0.11	0.16	0.06	0.12
B4	0.3	0.12	0.14	0.05	0.13
C1	0.2	0.2	0.6	0.03	0.01
C2	0.4	0.3	0.7	0.05	0.02
C3	0.2	0.4	0.8	0.07	0.03
C4	0.2	0.4	0.4	0.06	0.01
D1	0.03	0.08	0.08	0.04	0.02
D2	0.02	0.07	0.06	0.03	0.03
D3	0.04	0.06	0.07	0.02	0.03
D4	0.03	0.07	0.08	0.01	0.11

Table : 2 Heavy metal analysis of groundwater samples collected around Ariyalur district in the month of August 2015(monsoon)

Station	Cu	Zn	Fe	Pb	Ni
A1	0.07	0.05	0.05	0.04	0.07
A2	0.09	0.04	0.04	0.03	0.06
A3	0.08	0.03	0.03	0.04	0.05
A4	0.07	0.03	0.06	0.05	0.06
B1	0.05	0.05	0.06	0.04	0.03
B2	0.04	0.04	0.07	0.05	0.04
B3	0.03	0.06	0.07	0.06	0.03
B4	0.02	0.05	0.08	0.07	0.02
C1	0.08	0.09	0.08	0.07	0.07
C2	0.07	0.08	0.06	0.06	0.08
C3	0.06	0.9	0.06	0.05	0.07
C4	0.06	0.07	0.08	0.04	0.06
D1	0.11	0.09	0.08	0.02	0.07
D2	0.9	0.08	0.09	0.01	0.07
D3	0.12	0.08	0.08	0.01	0.06
D4	0.13	0.07	0.07	0.06	0.06

Table: 3 Heavy metal analysis of groundwater samples collected around Ariyalur district in the month of November 2015(postmonsoon)

Station	Cu	Zn	Fe	Pb	Ni
A1	0.04	0.03	0.04	0.04	0.06
A2	0.02	0.04	0.03	0.03	0.05
A3	0.03	0.04	0.02	0.01	0.04
A4	0.06	0.03	0.05	0.02	0.03
B1	0.04	0.06	0.05	0.03	0.06
B2	0.05	0.07	0.06	0.04	0.05
B3	0.06	0.08	0.07	0.05	0.04
B4	0.07	0.04	0.04	0.06	0.03
C1	0.08	0.9	0.02	0.07	0.08
C2	0.09	0.7	0.04	0.08	0.09
C3	0.06	0.04	0.03	0.09	0.07
C4	0.04	0.05	0.04	0.06	0.06
D1	0.07	0.04	0.08	0.05	0.05
D2	0.04	0.03	0.07	0.04	0.04
D3	0.05	0.02	0.05	0.03	0.06
D4	0.03	0.01	0.06	0.04	0.07

Table: 4 Mean values of metal ions concentrations of Ground water samples collected in and around Ariyalur district.

Station	Cu	ZSn	Fe	Pb	Ni
A1	0.27	0.04	0.06	0.03	0.27
A2	0.23	0.04	0.06	0.03	0.23
A3	0.23	0.03	0.06	0.03	0.33
A4	0.21	0.03	0.07	0.03	0.29
B1	0.13	0.07	0.08	0.03	0.06
B2	0.16	0.07	0.1	0.04	0.06
B3	0.16	0.08	0.1	0.05	0.06
B4	0.13	0.07	0.08	0.06	0.06
C1	0.12	0.39	0.23	0.05	0.05
C2	0.18	0.36	0.26	0.06	0.06
C3	0.10	0.44	0.29	0.07	0.05
C4	0.1	0.17	0.17	0.05	0.04
D1	0.07	0.07	0.08	0.03	0.04
D2	0.32	0.06	0.07	0.02	0.04
D3	0.07	0.05	0.06	0.02	0.05
D4	0.06	0.05	0.07	0.03	0.08

Copper(Cu)

Copper is essential substance to human life, but chronic exposure to contaminant drinking water with can result in the development of anemia, liver and kidney damage.⁽⁵⁾ Copper values varied from 0.06 to 0.32 ppm. In present study all the water samples are found below the permissible limit set by WHO (2 ppm).

Zinc(Zn)

Zinc is an essential and beneficial element in body growth. The clinical symptoms of zinc deficiency are anorexia, pica, impaired taste acuity, dry skin, impaired wound healing and increased susceptibility to infection, chronic deficiency in pediatric and adolescent age group causes growth retardation and delay of sexual maturation ⁽⁶⁾. In the present study, the concentration of zinc ranged between a minimum of and a maximum of 0.03 to 0.44 ppm. The values of zinc are showed within the limit of WHO (3.0) drinking water standard.

Iron(Fe)

Iron is widespread in nature and very abundant occurring at concentration of about 50,000 mg/kg in the earth's crust (Oehme, 1974). Iron occurs in minerals like biotite, magnetite, pyroxenes, ferric oxides and hydroxides. In ground water the common form of iron is the soluble ferrous ion. When exposed to atmosphere it is oxidized to the ferric state (Fe^{3+}) which is insoluble and causes brown discolorations of water and introduces a better sweet astringent taste and stains to laundered cloths for most purposes the iron concentration should not exceed 0.5 mg/L. The presence of even this amount can be a nuisance in some industrial applications such as textile processing plants. The value of iron varied from 0.06 to 0.29 ppm. The Iron content of the water sample is also within the permissible limit of WHO (1.0 ppm).

Lead (pb)

Lead is a naturally occurring heavy metal present in small amounts in the earth's crust. Although lead occurs naturally in the environment anthropogenic activities such as fossil fuels burning, mining and manufacturing contribute to the release of high concentrations. Lead has many different industrial, agricultural and domestic applications. It is currently used in the production of lead acid batteries, ammunition, metal products and devices to shield X-rays. It is reported by different scientists that, high concentration of lead has been implicated in causing anaemia, kidney damage and cerebral oedema to humans. The value of lead varied from 0.02 to 0.07 ppm. It is seen that all the samples have lead levels above the WHO standard of 0.01 ppm. This shows that lead is generally toxic and it accumulates in the kidney and skeleton.

Nickel (Ni)

Nickel has been considered to be an essential trace element for human and animal health. The values of Nickel 0.04 to 0.33 ppm. The Nickel level above WHO limit 0.01 ppm. Patients suffer from hair loss in this study were related to the contaminant essential trace metal but toxic in large amounts to human health. It is considered as carcinogenic to humans.

Fig. 2 Seasonal Variation of Copper values collected from different sampling from Ariyalur district.

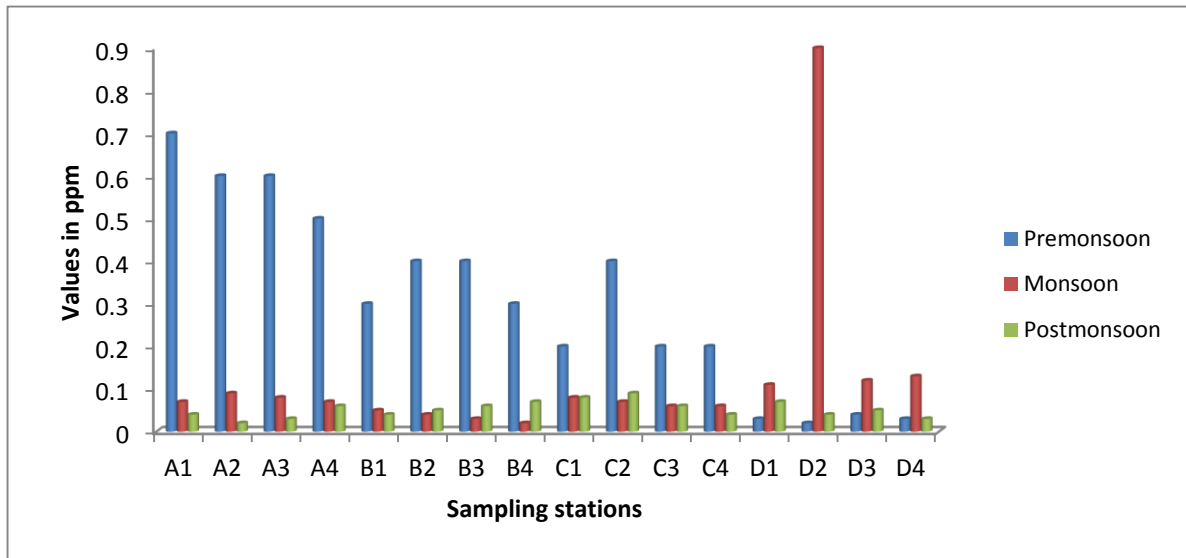


Fig. 3 Seasonal Variation of Zinc values collected from different sampling from Ariyalur district.

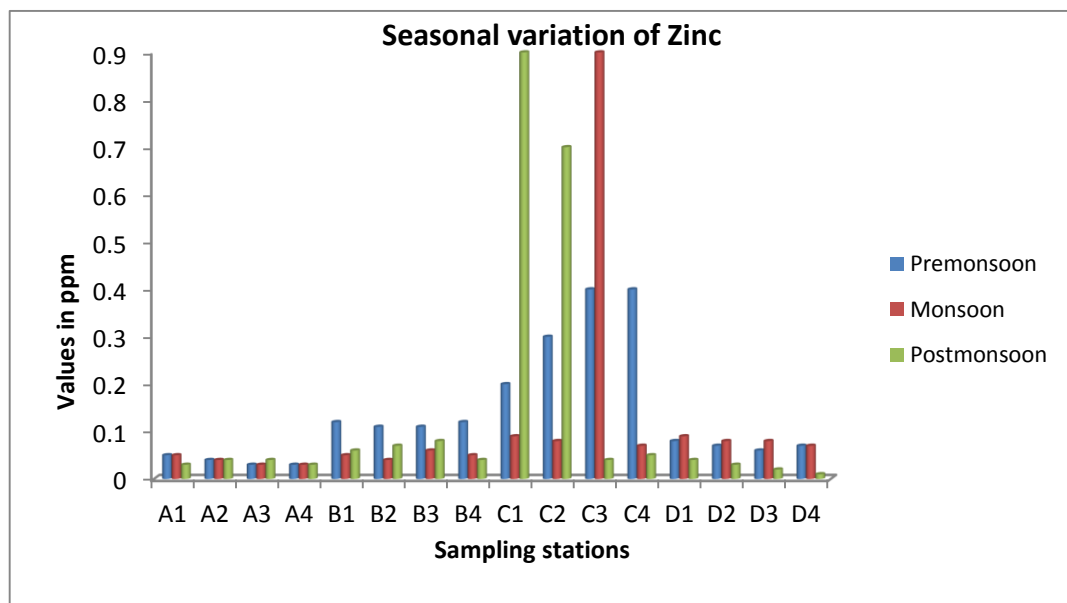


Fig. 4 Seasonal Variation of Iron values collected from different sampling from Ariyalur district.

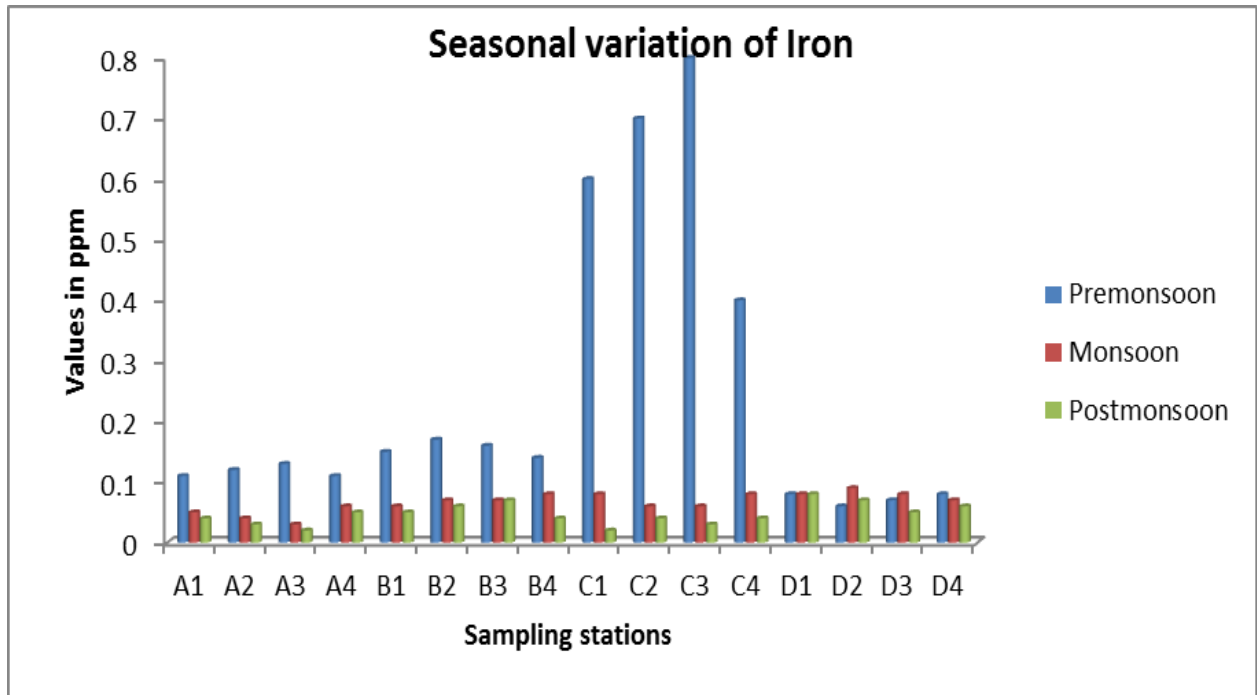


Fig. 5 Seasonal Variation of Lead values collected from different sampling from Ariyalur district.

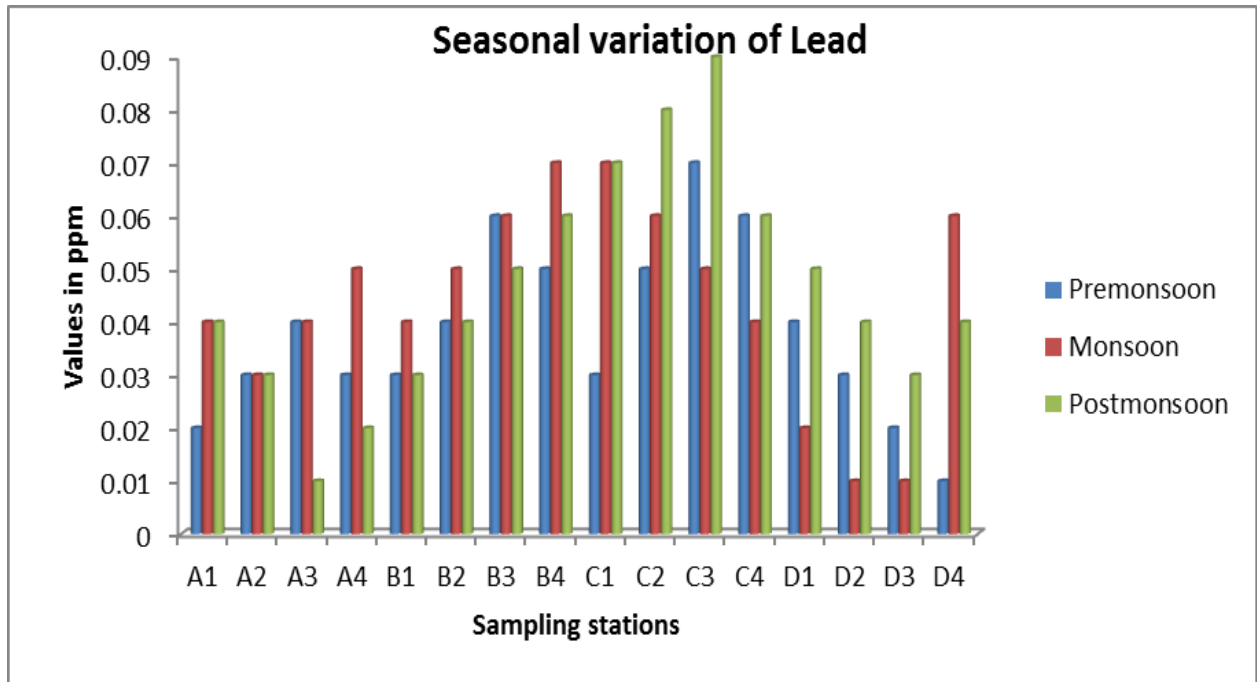
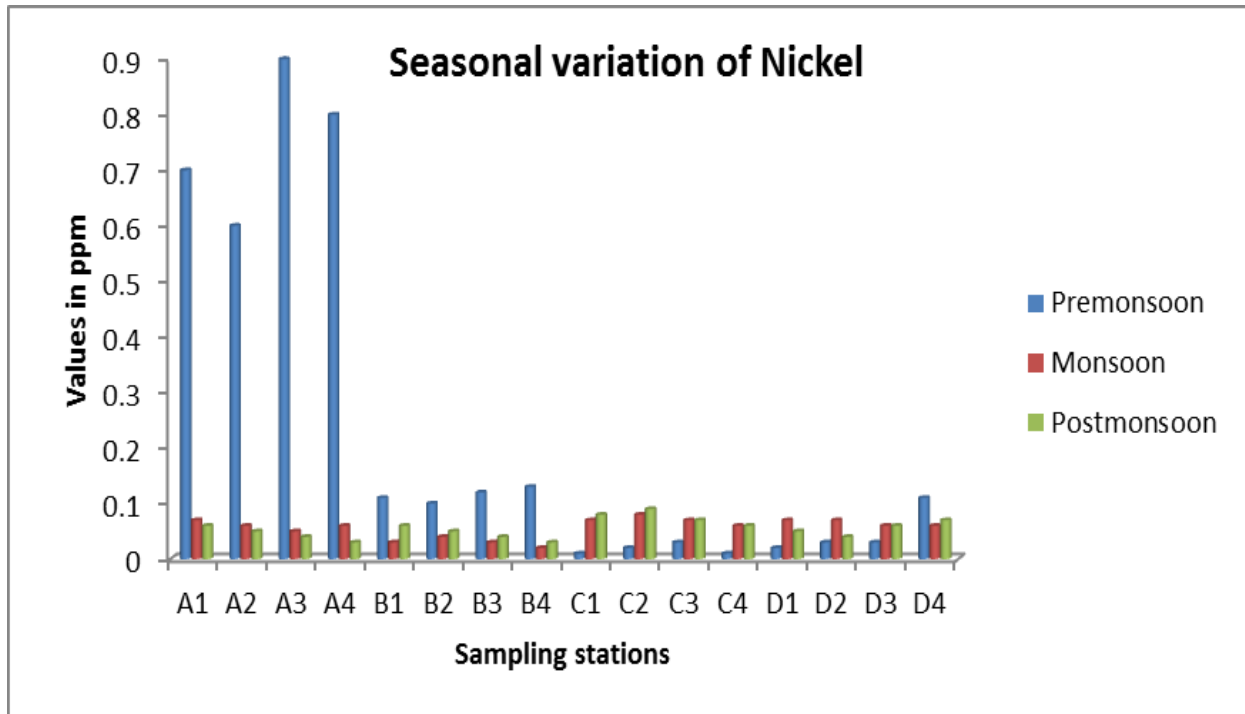


Fig. 6 Seasonal Variation of Nickel values collected from different sampling from Ariyalur district.



Conclusions

In the present investigation, the heavy metal concentration such as, lead and Nickel are well above the permissible limits prescribed by WHO. However, the concentrations Copper, Zinc and Iron in the ground water samples of the study area were found to be below detectable level. Even though, the condition is very bad at present, but if the same continues in future groundwater source will be completely polluted and become unfit for drinking and other purposes. This observation indicates contamination of the environment. Therefore, most of the water from these wells is suitable for domestic use and its unlikely to pose a major health risk to consumers. Hence, it is high time to preserve and protect this valuable ground source. Thus dumping of waste polluted materials should be avoided and they should not be let into the area. Hence lot of precaution should be done to avoid consequence.

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