

# Heavy Metal Analysis in Soil: A Case Study through the Noyyal River, Tirupur

Aswathy V Gopal\*, Arun O S, R. Gobinath, D. Saranydevi

Department of Civil engineering, Jay Shriram Group of Institutions, Avinashpalayam, Tirupur, Tamilnadu, India

## Abstract

*Noyyal River is a tributary of Cauvery River which rises from Vellingiri hills in Western Ghats, Tamilnadu South eastern India and drains in to Cauvery River. The river flows through four states, Coimbatore, Tirupur, Karur and Erode in western Tamilnadu. Till the river reaches Tirupur, the pollution concentration is considerably low. But in the Tirupur area the rate becomes substantially high due to the textile effluent discharge and sustains downstream up to Orathupalayam dam. High chloride, BOD, conductivity, iron, and chromium is present in the river water. The high conductivity of Noyyal river water indicates the main parameter which makes the water unfit for irrigation. Due to the self curing of the river, the heavy metals will get accumulated in the surface of the soil under the river water. And it becomes immobile. The soil contains very high amount of iron and chromium, which clearly indicates the presence of dye waste water pollution.*

**Keywords:** Soil contamination, Noyyal River, Heavy metals, Chromium, Iron

\***Author for Correspondence** Email: aswathy.vg13@gmail.com

## INTRODUCTION

Surface water quality is controlled by complex anthropogenic and natural factors. River systems also play an important role in the sustainable development of the entire biophysical environment. River water quality is one of important factor directly concerning with health of human and living beings [1, 2].

Industries discharge variety of pollutants in the waste water including heavy metals, organic toxins, oil nutrients and solids. Many of the substances are toxic or even carcinogenic. Pathogens can obviously produce water born diseases in either human or animal hosts. These wastes also increase the concentration of suspended solids (turbidity), bacteria and virus growth leading to potential health impacts. Increase in nutrient load may lead to eutrophication; organic wastes increases the oxygen demand in water leading to oxygen reduction in water with potentially severe impacts on whole ecosystems [3, 4].

Interpretation of complex water quality data is difficult to understand and to communicate during decision making process. Assembling

the various parameters of the water quality data into one single number leads an easy interpretation of data, thus providing an important tool for management and decision making purposes. The purpose of an index is to transform the large quantity of data into information that is easily understandable by the general public. Water quality index exhibits the overall water quality at a specific location and specific time based on several water quality parameters. WQI is a set of standards used to measure changes in water quality in a particular river reach over time and make comparisons from different reaches of a river [5]. As the river water gets polluted, the soil enclosing the river also gets polluted. The river water comprise of heavy metals are the main reason for the soil contamination. As the river flows, the heavy metals get settled under the river water or at the banks of the river. Heavy Metals are defined as elements in the periodic table having atomic number more than 20 or densities more than 5g/cm<sup>3</sup> generally excluding alkali metals and alkaline earth metals. The environmental problems with heavy metals are that they as elements are un destroyable and the most of them have

toxic effects on living organisms when exceeding a certain concentration. Furthermore, some heavy metals are being subjected to bioaccumulation and may pose a risk to human health when transferred to the food chain. Soils, whether in urban or agricultural areas represent a major sink for metals released into the environment from a wide variety of anthropogenic sources [6]. Once in soil, some of these metals would be persistent because of their fairly immobile nature. Other metals however would be more mobile therefore the potential of transfer either through soil profile down to ground water aquifer or via plant - root uptake (bio available) is likely. When the food chain is concerned, one has to take into account the mobility and the bio availability of metals, because plant uptake of metals parallels the bio available fractions of the metals in soil [7].

Treated sludge contains microorganisms while treatment of effluents. As a final product of effluent treatment plant, it contains useful and toxic substances. Useful materials like microorganisms and other soil and toxic substances like pesticides and other heavy metals. It may be lead to soil pollution with the use of fertilizers with heavy metals. Zinc, Copper, cadmium and lead are four most common heavy metals released from road travel, automobiles in cities for at least 90% of the total metal concentration. The chemical composition of soil, particularly its metal content is environmentally important, because toxic metals concentration can reduce soil fertility, can increase input to food chain, which leads to accumulate toxic metals in food stuffs, and ultimately can endanger human health. Because of its environmental significance, studies to determine risk caused by metal levels in soil on human health and forest ecosystem have attracted attention in recent years [8–12].

## MATERIALS AND METHOD

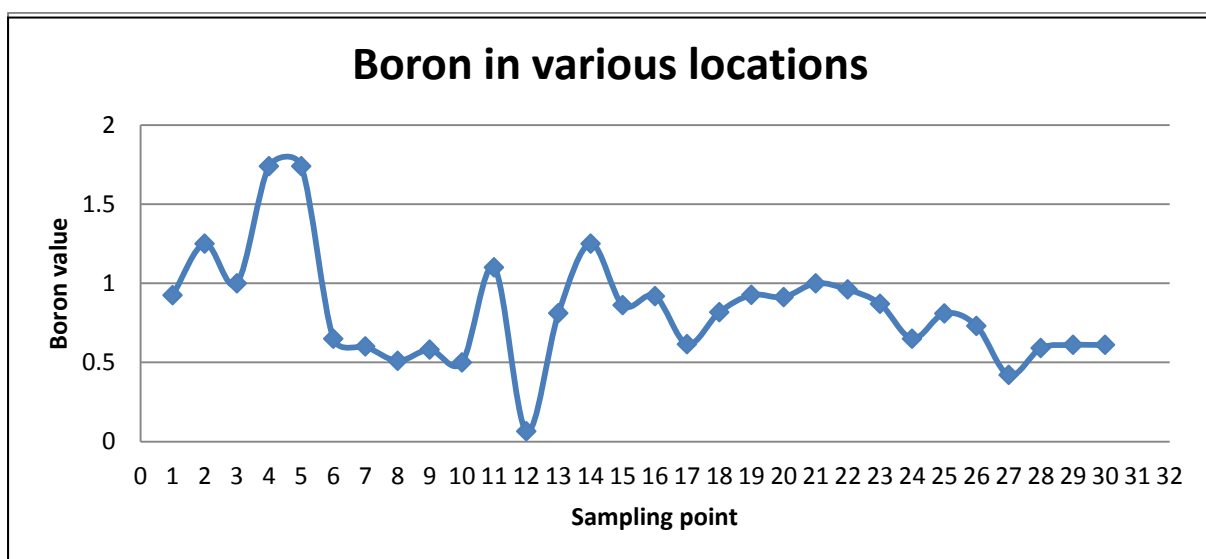
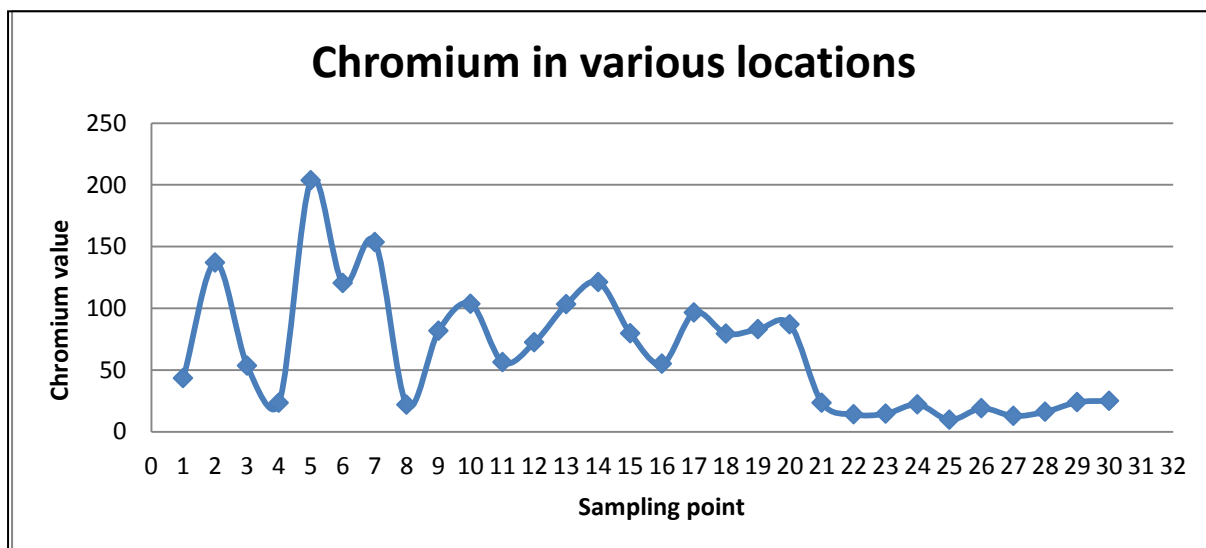
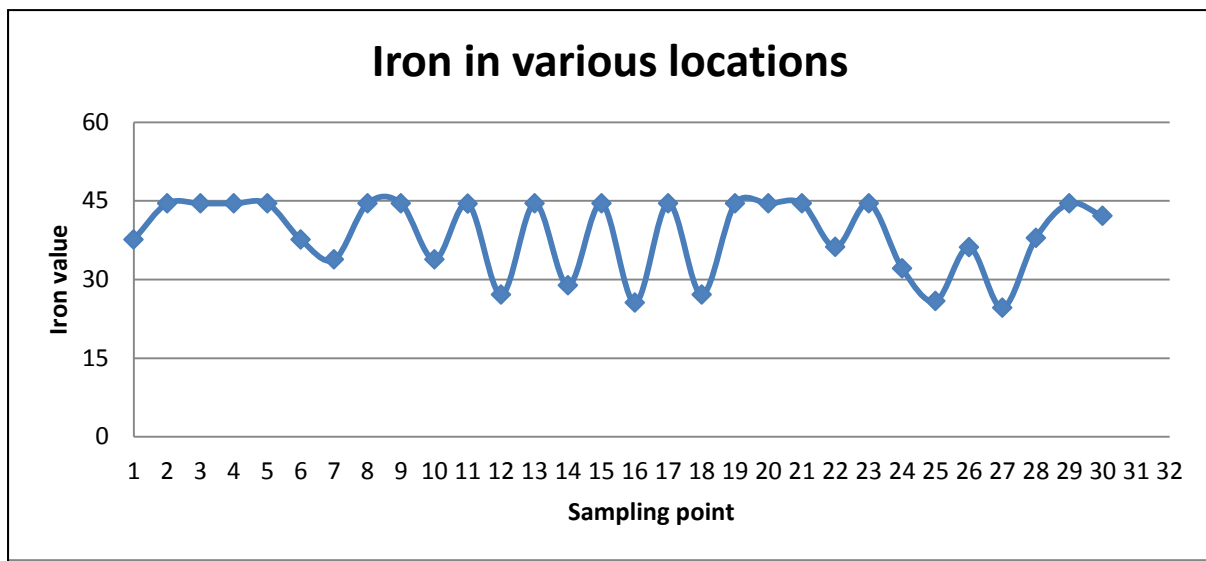
This study aims to monitor the soil quality in Noyyal River, Tirupur, Tamilnadu. For this we had selected 30 sampling point along the Noyyal River and took the GPS coordinates for the proper mentioning and identification of sampling locations. From each water sampling point we had collected the soil samples. This was for the identification of heavy metals. Due to the flow of river, the self curing phenomenon will happen and the heavy metals in the water will get settle down in the soil. The heavy metal are immobilize when trapped inside soil. So the testing of the soil particles will give the presence of heavy metals accurately.

### Study Area

The study area selected for the present study is Noyyal River, Tirupur, which is surrounded by textile and bleaching industries. The river only carries industrial effluents that stagnate in the riverbeds and percolate into the groundwater. The bleaching and dyeing process are the main causes of pollutants which include caustic soda, hydrochloric acid, sodium hydro sulphate, hypochlorite and peroxides. The river will only flow fully in the monsoon season, in all other season it will flow by carrying industrial effluents. The field data indicates that the water in different area have different colours.

## RESULTS AND DISCUSSION

On the basis of results obtained from the conducted tests it is clear that the soil is more polluted than the water as shown in figures. The river Noyyal was polluted from the beginning of dyeing and bleaching industries. Chromium, a heavy metal, which is highly toxic and carcinogenic, is highly present in the soil sample collected from the bottom of the river. And the content of iron is also very high. This indicates the contamination of river water by dye waste. From these results we can say that the self curing process is happening during the flow of this river, and all the heavy metals are getting settled at the bottom of the river.



## CONCLUSION

From this study it is clear that the level of pollution in the Noyyal River is not yet controlled properly. The character of this water is changing from place to place. Due to the self-purification phenomenon of the river, the heavy metals are settled at the bottom of the river. The high concentration of heavy metals in the soil samples clearly shows this point.

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