

**EVALUATION ON THE EFFECTS OF HEAVY METALS ON THE NOYYAL RIVER
WATER AND IT'S PURIFICATION USING *MUSASAPIENTUM*, *CITRUS X AURANTIUM*
AND *MORINGA OLEIFERA***

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ABSTRACT

Copper (cu) and lead (pb) contaminated River water poses a serious public health concern to rural population with unaffordable purification technologies. Therefore, development of a cost-effective, portable, environment and user-friendly purification technique is imperative. In the present study, we report on the purification of copper and lead using *Musa sapientum* and *Moringa oleifera*. Here I am using 3 plant samples they are *Musa sapientum*, *Citrus x aurantium* and *Moringa oleifera*. Compared to *Citrus x aurantium*, *Musa sapientum* and *Moringa oleifera* is mostly reacted and purified the copper and lead. First analysed the physical and chemical parameters of water and different plant extracts. Next using the Atomic Absorption Technology check the copper and lead level in water and plant samples. This paper will be beneficial for researchers working toward further improvement in water purification technologies.

KEYWORDS: Copper, lead, *Musa sapientum*, *Citrus x aurantium*, *Moringa oleifera*.**INTRODUCTION**

Globally water is a basic need for all living organisms. Clean water is vital role for living a healthy life, since polluted water can pose human health at risk through direct or indirect contact with dangerous chemicals (Madhazaynab et al., 2022). Water sources are important for drinking and another domestic purposes must have high degree of purity free from chemical pollution and microorganisms. The fast growth of urban areas has further affected the groundwater quality due to over exploitation of resources and improper waste disposal practices. (C. Gopalkrishnan et al., 2018).

The hydrosphere is an important segment of the environment, including 0.3% of the freshwater on earth, and it is easily reachable from lake, pond, and river systems. Water plays an important role in the various life processes of living creatures, and river water is a valuable natural resource for humans. River has great growth in economic change. Many human activities linked to economic development are responsible for water quality worsening. Disagreeable taste of drinking water, nauseating odour from lakes, rivers, and beaches, unsupervised growth of aquatic weeds, and decrease in number of fish are some indications of water contamination. To understand chemical occurrence in water bodies, certain general criteria of water quality are applied, such as ph, DO, BOD, and TDS (Ashali chandrakant kharake et al., 2021). Water contamination

has been a huge complication for most rivers in India.

Contamination loads from human lifestyle, both from local industry and drainage water and solid waste. Industrial effluent is one of the contributing sectors to river contamination (D Roosmini et., al 2018). The industrialization and municipal waste have resulted in a large amount of industrial waste water and domestic sewage, which has increased the pollution load of India's rivers and caused the worsening of river water environments (Hanxiaoaxu et al., 2022).

Water pollution by heavy metals is one of the most serious problems for the health of human beings. Heavy metals enter the ecosphere as highly stable and somewhat imperishable contaminants, polluting both surface and groundwater resources (Morziehmokarram et., al 2020).

The present-day human lifestyle is resulting in an increased amount of metal compounds in the environment. These compounds arise from the use of fertilisers and pesticides, mining, manufacturing, domestic waste discharge, and coal combustion. Heavy metal contamination in the aquatic environment is of global concern due to the potential toxicity of metals and their harmful effects on the ecosystem. Heavy metals are characterised by their long persistence, bioaccumulation, and biomagnification in the aquatic environment, so they

cause toxic effects from the source of pollution. Heavy metals that enter freshwater ecosystems are ultimately observed in the sediment and may bioaccumulate in marine organisms and subsequently in the food chain (Loannis Karaouzas et al., 2021).

Metals and metalloid ions are classified into three categories. The first category includes metals such as mercury, cadmium, and lead, which are toxic at minimum concentrations. The second category of metals is less dangerous (bismuth, indium, arsenic, thallium, and antimoney). (Madihazaynab., et al., 2022).

Heavy metals are any metallic element that has high solidity and is poisonous even at low amounts. Some of the typical heavy metals are mercury, lead, arsenic, chromium, cadmium, thallium, etc. These are also called trace elements, e.g., zinc, copper, and selenium. (Swaroop s sononeet et al., 2021).

Heavy metals are found in groundwater and surface water by human activities (unstandardized industrial process, municipal waste, excess and sometimes required chemicals are used in agriculture process). In most areas of India the concentration of heavy metals is higher than the Permissible limit of WHO. Some heavy metals are necessary for health but in Limited concentration high concentration creates harmful effect on health. Zinc and copper are major elements for health but in Limited concentration.

The river Noyyal arises from the Velliangirihills of Western Ghats. It flows through 4 main cities Tiruppur, Coimbatore, Erode and Karur. The river once considered as the holy river of coimbatore and Tiruppur but now the river is considered as heavily polluted river and it is also called as “dead river”. India is one of the world’s biggest producers and exporters of textiles and garments. India’s textile exports coimbatore and tiruppur is the two main cities contributed by 90%. The textile manufacturing process consumes thousands of gallons of water and at the same time, it also releases an huge amount of textile effluents. These effluents contain a high concentration of heavy metals, organic and inorganic compounds especially dyes which can cause serious health problems in humans. The industrial effluents discharged by the textile and the associated industries, the domestic wastes, and sewage disposal are the major sources of contamination in the Noyyal River (Abirami subramanian et al, 2022).

The Noyyal River is contaminated with heavy metals over the last few decades mainly due to phylogenesis activities predominantly by industrial wastes. (D. Karnanidhiet.al., 2022).

AIM AND OBJECTIVE

Aim

To perform a comparative and evaluation on the effects of heavy metals on the noyyal river and its purification

using musa sapientum, citrus x auris and moringa oleifera.

Objective

- To analyse the physio – chemical parameters of the surface water in Noyyal river at sulurand somanur.
- To analyse the physio – chemical parameters of different plants samples such musa sapientum, citrus x auris and moringa oleifera seed powder using water sample extracts.
- To evaluate the heavy metals like copper and lead in water samples and plant samples.
- A comparative studies of physio – chemicals and heavy metals in water sample and plantsample

MATERIALS AND METHODS

Sample collection and analysis

The surface water samples for the study were collected from 2 different places (figure 1 and 2) along the noyyal river which passes through 4 districts of Coimbatore, tiruppur, erode and karur. The water samples were collected in sterile plastic bottles and labeled (figure 3). The collected samples were stored at the laboratory for the for the analysis of various physical and chemical parameters such as Appearance, colour, odour, pH, total alkalinity, total hardness, calcium hardness, magnesium hardness, chloride, phosphorous, copper, lead, nitrate.



Figure 01: SOMANUR WATER.



Figure 02: SULUR WATER.

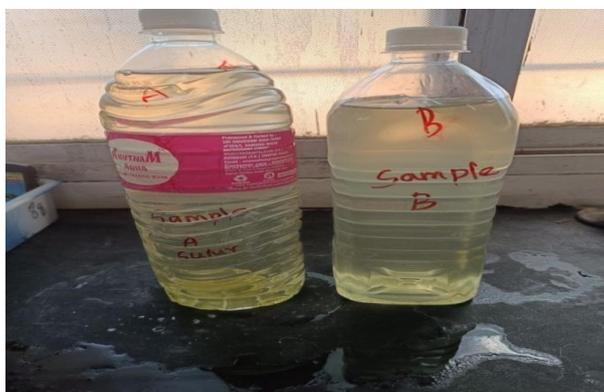


Figure 03: WATER SAMPLES.

S.no	Physical and chemical parameters	Method of analysis
1	Appearance	Visual
2	Colour	Visual comparison
3	Ph	Ph meter
4	Total alkalinity	Titration method
5	Total hardness	H ₂ SO ₄ titrimetric method
6	Calcium hardness	H ₂ SO ₄ titrimetric method
7	Magnesium hardness	Calculation method
8	Chloride	AgNO ₃ titrimetric method
9	Phosphorous	Spectrometric method
10	Copper	Atomic absorption spectrometric method
11	Lead	Atomic absorption spectrometric method
12	Nitrate	Spectrometric method

pH

pH is negative logarithm of hydrogen ion concentration. Measuring the amount of acid or alkaline present in the solution. Ph scale is ranges from 0-6.9 is acid 7 is neutral 7.1 – 14.0 basic. Here Ph is measured by using Ph meter.

Total alkalinity

Total alkalinity is measured by measuring the amount of acid. A measure of the ability of the water body to neutralize acids and bases and thus maintain stable ph. total alkalinity is measured by titration method. It

gives pale pink colour which persist for few minutes and turns colourless.

Calculation

Total alkalinity = $V \times N \times 50000$ / ml of sample mg/l of CaCO₃

V = Volume of H₂SO₄

N = Normality of H₂SO₄

Total hardness

Total hardness is a measurement of the mineral content

in water sample. Presence of dissolved salts of calcium magnesium. Here total hardness is measured by H_2SO_4 titrimetric method. Gives sky blue colour presence of total hardness.

CALCULATION

Total hardness = (B – S) x normality of H_2SO_4 x 50 x 1000 / volume of sample mg/l

B = Blank S = Sample

Calcium hardness

The amount of calcium ions present in the water. Calcium hardness is measured by H_2SO_4 titrimetric method gives wine red to purple blue colour.

Calculation

Calcium hardness = (B – S) x normality of H_2SO_4 x 50 x 1000 / volume of sample mg/l

B = Blank S = Sample

Magnesium hardness

The amount of magnesium ions present in the water.

Calculation

Magnesium hardness = total hardness - calcium

hardness

Chloride

Chloride ions naturally present in water. Chloride is measured by $AgNO_3$ titrimetric method gives reddish brown colour.

Calculation

Chloride in mg/l = $(V_1 - V_2) \times N \times 35.46 \times 1000 / V$ mg/l

V = Sample

V_1 = Value of sample V_2 = Blank value

Phosphorous

Phosphorous is essential nutrient for plants and animals. Phosphorous is measured by spectrometric method.

Copper and lead

Copper and lead is heavy metals which is measured by atomic absorption spectroscopy.

Nitrare

Here nitrate is measured by spectrometric method.

RESULTS AND DISCUSSION

S. no	Physical and chemical parameters	Norma l level	Sample a	Sample b	Banana peel Sample a	Banana peel Sample b	Orange peel sample a	Orange peel sample b	Drumstick seed powder sample a	Drumstick seed powder sample b
1	Appearance	-	vivable	vivable						
2	Colour	colourless	Light greenish white	Light greenish white	Lightyellow	Lightyellow	Light orange	Lightorange	yellow	Yellow
3	Odour	Chlorine	musty	Musty						
4	Ph	6.5-8.5	8-9	9	6-7	6-7				
5	Total alkalinity	-	0.2005	0.6004	-	-	-	-	-	-
6	Total hardness	200	210	179	-	-	5.0	3.0	7.5	12.0
7	Calciumhardness	200	35	25	-	-	-	-	0.5	6.0
8	Magnesium hardness	200	175	154	-	-	-	-	7.0	6.0
9	Chloride	1000	1.7	1.4	0.75	2.2	3.7	3.6	1.2	2.5
10	Phosphorous	-	300	253	0.93	2.8	3.1	4.0	1.5	2.4
11	Copper	-	0.012	0.010	0.008	0.006	0.013	0.09	0.05	0.04
12	Lead	-	0.006	0.006	0.003	0.002	0.006	0.005	0.004	0.002
13	nitrate	-	1.8	2.0	-	-	-	-	-	-

The present study concludes that the heavy metals are copper and lead is purified or removed by banana peel and drumstick seed powder.

SUMMARY AND CONCLUSION

The study was on the topic “ evaluation on the effects of heavy metals on the noyyal river water and its purification using *musa sapientum*, *citrus x aurantium* and *moringa oleifera* “. The water samples were collected from sulur and somanur lake. In the present study here i am using 3 different plants for the removal of copper and lead.

They are

- Banana peel (*musa sapientum*)
- Orange peel (*citrus x aurantium*)
- Drumstick seed powder (*moringa oleifera*)

Comparing to the orange peel, the banana peel and drumstick seed powder is most effective for the removal of copper and lead in river water.

The increased amount of lead in water leads to,

The water enters into blood and causes high blood lead level. It causes damage to the brain and kidneys, and can interfere with the production of RBC cells that carry

oxygen to all parts of the body.

The increased amount of copper in water leads to,

Consumption of high levels of copper can cause nausea, vomiting, diarrhoea, gastric (stomach) complaints and headaches. Drinking water will leave a metallic or bitter taste.

Noyyal river is contaminated by industrial effluents and textile wastes and dye. Due to water the contamination leads to increases the amount of pH, total alkalinity, total hardness, calcium hardness, magnesium hardness, nitrate, sulphate, phosphorous, chlorides and heavy metals are leads to many problems. The contamination water does not used for humans any other activities. Banana peel and drumstick seed powder is low cost and easily get it. In this method is very useful for poor people.

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