



# Seasonal Variations of Heavy Metals in Puthukulam Pond, Pudukkottai, Tamilnadu, India

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## Abstract

Heavy metals are derived from agricultural operations and industrial sewages ultimately find their ways into a variety of different water bodies and can produce a range of toxic effects in aquatic organisms, ranging from alternations to a single cell up the charges in whole population. The present study reports on the heavy metal concentrations in various places including station I and station II of Pudukulam pond, Pudukkottai. These two stations were exposed to heavy metal contaminated water system. The heavy metals like Cu, Zn, Mn, MI, Cr, Al, So, Li and K were determined in the water samples. All the heavy metals were seasonally varied, and their concentrations were under permissible level in the water samples of both stations.

## Keywords

Pond, Water samples, Heavy metal concentrations, Seasonal variations.

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## INTRODUCTION

Pollution of water resources is a serious and growing problem but despite the existences of relevant legislation the pollution of the aquatic environment by toxic chemical pollutants continues to occur, with domestic and industrial sewages being the main sources responsible for contamination of aquatic environments. Heavy metals are derived from agricultural operations and industrial sewages ultimately find their ways into a variety of different water bodies and can produce a range of toxic effects in aquatic organisms, ranging from alternations to a single cell up the charges in whole population. Heavy metal contamination may have deteriorating on the ecological balance of the recipient environment and a diversity of aquatic flora and fauna [1, 2]. Metals

in the surface water system largely come from anthropogenic and natural resources now a days, metals levels resulting from natural resources are relatively low excessive meatl amounts in a aquatic environment cause serious problem for both people and the environment [3, 4, 5]. Trace -elements, as pollution sources, in waste water which are used in irrigation are also of great importance for public health due to their involvement in the Food chain [6, 7, 8].

Concern over the possible ecological effect of the increasing accumulation of metallic contaminants in the environment is growing. For this reason, the investigation of heavy metals in soil is essential since even slight changes in their concentration above the acceptable levels, whether due to natural or

anthropogenic factors, can result in serious environmental and subsequent health problems [9]. The seriousness of heavy metal contamination was further compounded by the fact that they are generally water-soluble, non-degradable, vigorous oxidizing agents and are strongly bonded to many biochemicals inhibiting their functions. Most metallic elements occur naturally in estuarine environments, and are classified as pollutants only when added by man in quantities sufficient to produce deleterious effects [10]. Arsenic is a naturally occurring element found widely in the environment. However, on recent days the level of arsenic in the environment has increased several folds due to its use as pesticide, defoliant, electronics, thermal power plants, wood preservatives and metal industry [11]. The basins of many rivers extend over very densely populated areas and are subjected to intensive exploitation by both industrial and agricultural activities. Such activities often result in the introduction of nutrients and potentially hazardous levels of heavy metals into the riverine ecosystem. Once discharged into the environment, the behavior and fate of polluting substances will be determined by the combined effects of different variables such as the compound's physicochemical properties, river hydrology and hydrochemistry [12].

Heavy metals affect every level of the food web, from producers in the trophic levels to the highest order carnivore by residing in the system and magnifying at every trophic status [2]. Hence the present study aimed to investigate the seasonal variation of heavy metals concentrations in water samples of Puthukulam Pond, Pudukkottai.

#### MATERIALS AND METHODS

Samples were collected from two station within the fresh water Puthukulam Pond, Pudukkottai (near Ayyanarpuram and Bhuvaneshwari Amman Temple) location in Tamil Nadu, India (laying at 10.38° North lat and 78.82° East long). Monthly basis for one-year study from November 2015 to October 2016. For the present study water samples were collected at the

surface of the Pond at 11.30 am - 12.30 pm in order to maintain uniformity. Samples were collected in clean white polythene containers (high density) collected samples were brought to the laboratory and kept in the refrigeration for later analysis.

#### RESULTS AND DISCUSSION

Several hazardous effects of heavy metals depicting different physiological and biochemical problem present. Various heavy metals such as zine, copper, nickel, chromium, aluminum, magnesium, sodium, lithium and porossium are dispersed in our dwelling environment comprising plants, animals, human, air, water and soil.

Heavy metals causing animals water samples were collected at Puthukulam Pond, Pudukkottai and analyzed the heavy metals for a period of one year from November 2015-October 2016 and the results were presented in the form of Tables 1, 2 in Station I, II. In the present study heavy metals is one of the most important in organic pollution parameters like Zn, Mn, Ni, Cr, Al, So, Li and K. Most of the environmental charges of the earth are slow enough to permit living forms to adapt to the charges. In the present study Cu and Zn very, less amount noted in May month and also Mg and So were very less amount present in the during the research period 2016 march. Seasonal variation Heavy metals of Puthukulam pond, Pudukkottai K 0.069 mg/l highest level present in Feb 2016 and also highest levels present in Al 0.082 mg/l August month seasonal variation.

In the past two decades, science, industry medicine and agriculture have exposed number of exotic chemicals. The toxicity depends on the physicochemical properties of the water and amount of heavy metals contamination. Cu, Zn, Mn, Ni, Cr, Al, Na, Li and K values were under prescribed limits in all the stations. High pH of lake water may result in the reduction of heavy metals toxicity [13]. Zn, Mn, Ni and Cr are present in large amount in nature water and relatively high level is suggestive of the influence of refuse dump and domestic sewage sources.

**Table 1. Seasonal variations in the Heavy Metals of the Puthukulam Pond, Pudukkottai, during Nov 2015 to Oct 2016.**

Parameter	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	June 2016	July 2016	Aug 2016	Sep 2016	Oct 2016
Cu (mg/l)	0.045	0.054	0.026	0.052	0.033	0.025	0.029	0.027	0.035	0.047	0.048	0.043
Zn (mg/l)	0.070	0.074	0.055	0.074	0.099	0.088	0.023	0.099	0.037	0.035	0.062	0.099
Mn (mg/l)	0.077	0.094	0.074	0.072	0.028	0.054	0.094	0.071	0.099	0.076	0.072	0.064
Ni (mg/l)	0.074	0.095	0.078	0.072	0.036	0.055	0.094	0.071	0.099	0.074	0.067	0.065
Cr (mg/l)	0.094	0.077	0.031	0.055	0.042	0.083	0.064	0.022	0.088	0.062	0.093	0.099
Al (mg/l)	0.070	0.042	0.070	0.072	0.059	0.027	0.044	0.049	0.057	0.082	0.032	0.067
So (mg/l)	0.052	0.053	0.065	0.063	0.049	0.061	0.057	0.047	0.059	0.047	0.046	0.052
Li (mg/l)	0.062	0.043	0.045	0.047	0.061	0.053	0.083	0.062	0.063	0.060	0.058	0.057
K (mg/l)	0.068	0.054	0.057	0.069	0.060	0.064	0.068	0.067	0.059	0.060	0.055	0.066

**Table 2. Seasonal variations in the Heavy Metals of the Puthukulam Pond, Pudukkottai, during Nov 2015 to Oct 2016.**

Parameter	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	June 2016	July 2016	Aug 2016	Sep 2016	Oct 2016
Cu (mg/l)	0.043	0.052	0.024	0.050	0.031	0.023	0.027	0.025	0.034	0.045	0.046	0.043
Zn (mg/l)	0.069	0.071	0.053	0.067	0.098	0.086	0.021	0.098	0.035	0.033	0.060	0.098
Mn (mg/l)	0.075	0.072	0.072	0.070	0.027	0.053	0.093	0.069	0.098	0.074	0.070	0.063
Ni (mg/l)	0.073	0.093	0.076	0.071	0.035	0.053	0.092	0.069	0.097	0.073	0.065	0.063
Cr (mg/l)	0.092	0.076	0.029	0.053	0.040	0.082	0.063	0.023	0.089	0.060	0.092	0.099
Al (mg/l)	0.069	0.041	0.068	0.069	0.059	0.026	0.043	0.047	0.056	0.080	0.030	0.062
So (mg/l)	0.051	0.052	0.063	0.062	0.048	0.061	0.057	0.045	0.059	0.046	0.044	0.052
Li (mg/l)	0.062	0.043	0.045	0.046	0.059	0.053	0.083	0.060	0.061	0.059	0.057	0.054
K (mg/l)	0.059	0.056	0.057	0.069	0.060	0.064	0.068	0.068	0.059	0.060	0.053	0.069

## CONCLUSION

Bioaccumulations of heavy metals in the water bodies adversely affect the liver, muscle, kidney and other tissues of fish body. The accelerated release of heavy metals is even endangering certain aquatic species and also causing extinction of some species of aquatic fauna. Therefore, release of industrial effluents and sewages should be avoided.

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