IOSR Journal Of Pharmacywww.iosrphr.org
(e)-ISSN: 2250-3013, (p)-ISSN: 2319-4219
Volume 7, Issue 9 Version. II (September 2017), PP. 18-23

Evaluation of CV Technology for reducing levels of heavy metals in polluted Hussainsagar lake water, Hyderabad, Telangana state, India.

Sreenu Noothi*[1], C. Venkateswar[2], B. Reddya Naik[3], J. Avinash Kumar[4].

[1, 3] *Department of Zoology, Osmania University, Hyderabad- 500007, Telangana, India*

[2, 4,] *Pharmacognosy and Medicinal Plants Lab, Department of Botany, Osmania University, Hyderabad 500007, Telangana, India*

Corresponding Author: Sreenu Noothi,

Abstract: *Heavy metals are stable and are determined as environmental contaminants since they cannot be degraded or destroyed, therefore they accumulate in the soils, water and sediments. Three water i.e., control water (Bore water), polluted and treated Hussainsagar lake water were collected from Hyderabad area which were analyzed to investigate the concentrationof heavy metals like Cr, Mn, Fe and Co. In the present study polluted Hussainsagar lake water was treated by using C.V. Technologyfrom 2012 to 2015. The results indicated that concentrations of heavy metals were very high in polluted Hussainsagar lake water compared to control and treated Hussainsagar lake water which were within the permissible levels. The treated Hussainsagar lake water showed concentration of all metals below detectable range except manganese.*

Keywords: *CV technology, Heavy metals, Hussainsagar Polluted water, Osmania University bore water*

Date of Submission: 16-09-2017 Date of acceptance: 25-09-2017

I. INTRODUCTION

Heavy metals are serious pollutants due to their toxicity, persistence in natural conditions and ability to be incorporated into food chains [25, 17, 4 and 21].The rapid development of industrialization, urbanization and agricultural practices has been threatening the ecological health of riparian wetlands [19]. In recent years, the contamination of aquatic systems has become a problem of great concern throughout the world [14]. The domestic sewage and uncontrolled industrial effluent discharges are highly influencing the water form of untreated effluents by industries in Hussainsagar lake catchment indicate the point sources of quality and migration patterns of heavy metals released in to the environment in the pollution [23].The Musi river which is carrying heavy loads of pollutants including industrial effluents and untreated domestic sewage every day has already been life and death problem for the people all along its bank of villages, Uppal, Nagole, Hayatnagar, Ghatkesar, Bibinagar, Pochampally, Valigonda, etc. [24]. In this study the heavy metals were in water effected by the surrounding area and public health also.

II. MATERIAL AND METHODS

2.1 Study Area

Hyderabad is the capital of Telangana state. The water body selected for the present investigation is a manmade tank (17^{o}25′02.32″N, 78^{o}31′57.43″E) formed due to the construction for fish culture. Water spread area of the control tank was 14,508 lts, Hussainsagar lake water tank was 14,280 lts and treated Hussainsagar Lake water tank was 14,293 lts. Climate is tropical wet and dry with most rainfall from June to October. The samples were collected in four places of the tank and analyzed.

2.2 Methods

The analysis of heavy metals (Chromium (Cr), Manganese (Mn), Iron (Fe) and Cobalt) in three different water samples were used by AAS method. (AAS method means Atomic Absorption Spectrophotometer - Model Varian Spectra AA20).

Permissible limits for drinking water quality according to World Health Organization (WHO) and Indian Standard Institution (ISI) are compared in this article.

III. RESULT AND DISCUSSION

The variations in heavy metals are depicted in table 1, 2 and 3.

3.1 Chromium

The Chromium levels increased with decreasing distance from the effluent channel [7], Chromium compounds are highly toxic contaminant. These compounds are generated from industrial plants such as leather tanning, textile dyeing, electroplating, and wood preservations [5]. Concentrations of chromium in natural water that have not been affect by waste disposal are commonly less than 10 ug/l. The median value for the public water supplied was 0.43 ug/l [8]. Durum and Haffty (1963) reported 5.8 ug/l of Cr in North American rivers. Chromium enters the environment through natural and anthropogenic sources [1]. Taylor *et al* (1964) reported that maximum allowable concentration of 0.1 ppm Cr recommended for irrigation water. Cr toxicity results in irritation of gastrointestinal mucosa, bronchopneumonia, chronic bronchitis and tracheid's.

In the present study chromium level in control water is below recommended level but whereas it is high in untreated Hussainsagar water and below detectable level in treated Hussainsagar waterwhich infers that the control and treated Hussainsagar water can be used both for drinking and irrigation as they both contain chromium ranges within permissible limits.

3.2 Manganese

Pollution rich in organic matter (e.g., runoff from landfills, compost, brush or silage piles, or chemicals such as gasoline) can add to the background level by increasing manganese release from soil or bedrock into groundwater and untreated sewage and industrial effluents are the primary source of pollution to the soil [16]. Mn concentrations in the range of 0.24–0.35 mg/L can lead to memory lapses in children [15]. Similar findings have also reported decreased concentration and attentiveness in classes by children who drink water with a high Mn concentration [27 and 28]. Neurotoxicity has been implicated for adults over 50 years who drink Mn-rich water [18]. Mn usually affects the brain and the central nervous system, causing impaired neurological and neuromuscular control, among other symptoms [2].

The levels of manganese is found to be within the range specified by WHO standards and IS 10500:1991 standards which indicates that the water is in usable condition.

3.3 Iron

Fe is an essential metal for most living organisms and humans. It is a constituent of proteins and many enzymes, including hemoglobin and myoglobin [29 and 6]. It is usually more abundant in freshwater environment than other metals, due to its high occurrence on Earth [11]. Fe deficiency can lead to anemia and fatigue, which are usually common among children under the age of five, pregnant women and immunocompromised individuals, thus making them vulnerable to numerous infections [12].

WHO do not have a guideline for Fe in drinking water, but the guideline value of DWAF is 0.1 mg/L, and that of the U.S. EPA is 0.3 mg/L [3 and 10]. These guidelines were exceeded throughout the sampling period. High Fe concentration together with its precipitate in aquatic ecosystems do have negative effects on the behavior, reproduction and survival of aquatic animals [13 and 22].

The levels of Iron in the water sample are below detectable range which specify that the waters is in cultivation form.

3.4 Cobalt

The concentration of total cobalt in fresh waters is generally low. Higher concentrations are generally associated with industrialized or mining areas.Drinking water quality guideline for cobalt was not recommended due to lack of data in the literature. It is recommended that the interim maximum concentration of total cobalt should not exceed 110 µg/L to protect aquatic life in the freshwater environment from acute effects of cobalt. Heavy metal status of sediment in river Cauvery, Karnataka [20].
The cobalt levels are very low and are below detectable level so are in cultivation form.

IV. CONCLUSION

All heavy metals are within the permissible limits in Control and treated Hussainsagar lake water. The polluted Hussainsagar lake water have shown high values. These results indicate that, the Hussainsagar lake water is alkaline, less productive in nature, highly polluted, not suitable for drinking and culture of fishes.

If in future any water body is polluted by sewage and industrial effluents etc. that water can be treated by using C.V. technology and the pollutants studied in this research can be brought to permissible levels and such treated water can be reused for irrigation, fishing and generation of hydroelectricity etc.

ACKNOWLEDGEMENT

I thank Prof. C. Venkateswar for giving the opportunity to treat the waste water by his patented technology. The Department of Zoology, Osmania University, Telangana has provided the required financial support, technical support and space to compile the data, so it is highly acknowledged.

Table -1: Heavy Metals of CON, UHW and THW during the year 2012-2013

S.No.	Parameter	Mean ± SD			WHO	IS
		CON	UHW	THW	Standards	Standards
1.	Chromium(Cr)	0.033±0.002	0.878±0.019	BDL	0.05	0.05
2.	Manganese(Mn)	0.04±0.02	0.335±0.003	0.023±0.002	0.05	0.1-0.3
3.	Iron(Fe)	0.526±0.416	3.317±0.372	BDL	0.3	0.3-1.0
4.	Cobalt(Co)	0.34±0.02	0.74±0.082	BDL	-	0.02

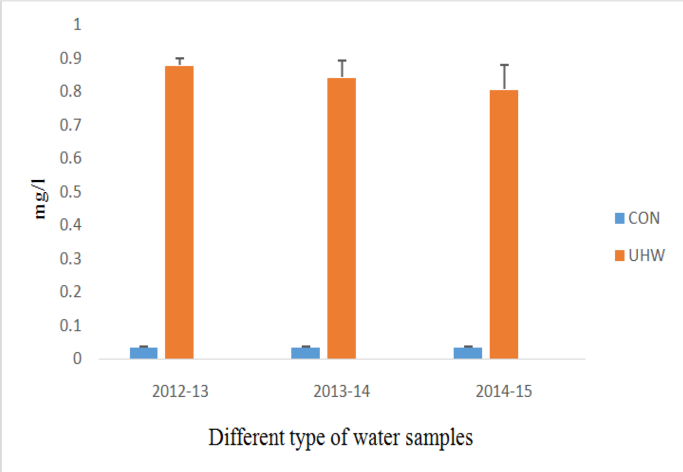
Table -2: Heavy Metals of CON, UHW and THW during the year 2013-2014

S.No.	Parameter	Mean ± SD			WHO	IS
		CON	UHW	THW	Standards	Standards
1.	Chromium(Cr)	0.034±0.002	0.841±0.050	BDL	0.05	0.05
2.	Manganese(Mn)	0.043±0.031	0.344±0.003	0.024±0.002	0.05	0.1-0.3
3.	Iron(Fe)	0.51±0.264	2.796±0.248	BDL	0.3	0.3-1.0
4.	Cobalt(Co)	0.35±0.025	0.85±0.033	BDL	-	0.02

Table -3: Heavy Metals of CON, UHW and THW during the year 2014-2015

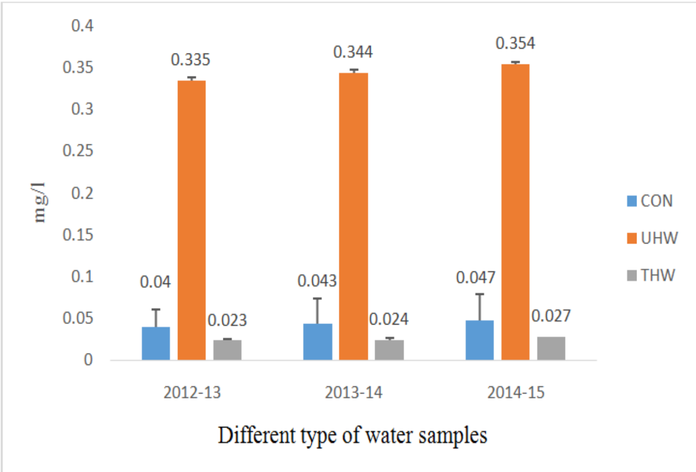
S.No.	Parameter	Mean ± SD			WHO	IS
		CON	UHW	THW	Standards	Standards
1.	Chromium(Cr)	0.034±0.003	0.807±0.071	BDL	0.05	0.05
2.	Manganese(Mn)	0.047±0.032	0.354±0.003	0.027±0.0009	0.05	0.1-0.3
3.	Iron(Fe)	0.47±0.458	4.9±0.458	BDL	0.3	0.3-1.0
4.	Cobalt(Co)	0.32±0.021	0.668±0.155	BDL	-	0.02

Fig: 1 Satilite image of Polluted Hussainsagarlake, Hyderabad.



CON = Control Water, UHW = Untreated Hussainsagar Water

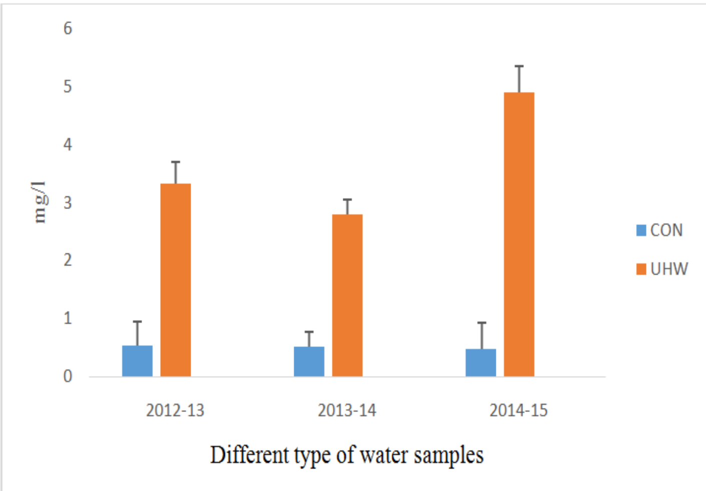
Fig: 2 Chromium in Control, Hussainsagar and Treated Hussainsagar water during 2012 to 2015



CON = Control Water, UHW = Untreated Hussainsagar Water,

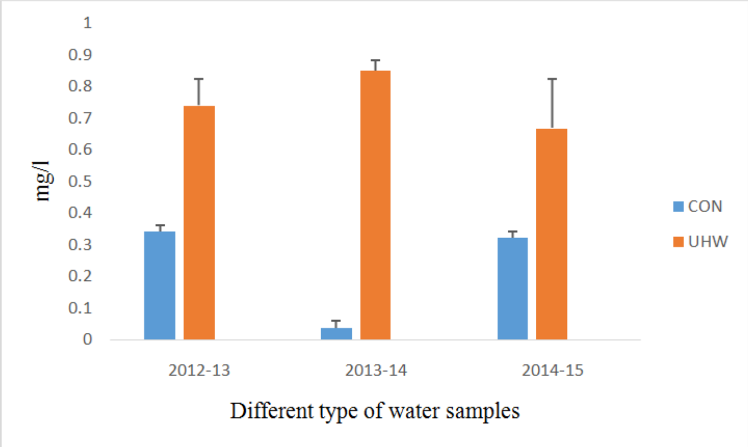
THW = Treated Hussainsagar Water

Fig: 3 Manganese in Control, Hussainsagar and Treated Hussainsagar water during 2012 to 2015



CON = Control Water, UHW = Untreated Hussainsagar Water

Fig: 4 Iron in Control, Hussainsagar and Treated Hussainsagar water during 2012 to 2015



CON = Control Water,   UHW = Untreated Hussainsagar Water,

Fig: 5 Cobalt in Control, Hussainsagar and Treated Hussainsagar water during 2012 to 2015

REFERENCES

[1]. Abbasi S.A., Nipaney, P.C and Soni, R (1991a). Occurence, essentiality and toxicity of chromium, J. Inst. Public Health Engineers, India.90(2). 25 pp.

[2]. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Manganese. (2012). Available online: http://www.atsdr.cdc.gov/toxprofiles/tp151.pdf (accessed on 15 April 2015).

[3]. American Ground Water Trust. The American Well Owner, (2002). Available online: http://www.agwt.org/ content/iron-problems (accessed on 24 November 2015).

[4]. Armitage PD, Bowes MJ, Vincent HM, (2007). Long-term changes in macroinvertebrate communities of a heavy metal polluted stream: The river nent (Cumbria, UK) after 28 years. River Res. 23:997–1015.

[5]. Bayazit S.S and KerkezO¨ (2014). Hexavalent chromium adsorption on super paramagnetic multi-wallcarbon nanotubes and activated carbon composites. Chemical Engineering Research and Design 92: 2725–2733.

[6]. Brody, T. (1999). Nutritional Biochemistry, 2nd ed.; Academic Press: San Diego, CA, USA, pp. 697–730.

[7]. DerejeHoma, Ermias Haile, and Alemayehu P. Washe., (2016). "Determination of Spatial Chromium Contamination of the Environment around Industrial Zones" International Journal of Analytical Chemistry, Volume 2016, Article ID 7214932, 7 pages

[8]. Durfor, C. N and Becker, Edith (1964). Public water supplies of the 100 largest cities in the United States, 1962, U.S. Geological Survey Water-Supply Paper 1812, 364 p.

[9]. Durum, W.H. &Haffty, J. (1963). Implications of the minor element content of some major streams of the world. GeochimicaCosmochemicaActa, 27, 1.

[10]. DWAF,(1996). South African Water Quality Guidelines, vol. 8: Field Guide, 1st ed.; DWAF: Pretoria, South Africa.

[11]. Forstner, U.; Wittmann, G.T.W. (1979). MetalPollutionin theAquaticEnvironment; Springer-Verlag: Berlin, Germany.

[12]. Garvin, K.S. Health Effects of Fe in Drinking Water. Available online: http://www.livestrong.com/article/ 155098-health-effects-of-iron-in-drinking-water (accessed on 24 November 2015).

[13]. Gerhardt, A. (1992). Subacute effects of iron (Fe) on Leptophlebiamarginata (Insecta: Ephemeroptera). FreshwaterBiol.27, 79–84.

[14]. Honggang ZHANG, Baoshan CUI, Rong XIAO, Hui ZHAO. (2010). Heavy metals in water, soils and plants in riparian wetlands in the Pearl River Estuary, South China. Procedia Environmental Sciences 2,1344–1354.

[15]. Joshua N. Edokpayi., John O. Odiyo ., Oluwaseun E. Popoola and Titus A. M. Msagati. (2016). Assessment of Trace Metals Contamination of Surface Water and Sediment: A Case Study of Mvudi River, South Africa, www.mdpi.com/journal/sustainability, 8, 135; doi:10.3390/su8020135.

[16]. Khaled S., Balkhair., Muhammad Aqeel and Ashraf. (2016). Field accumulation risks of heavy metals in soil and vegetable crop irrigated with sewage water in western region of Saudi Arabia, Saudi Journal of Biological Sciences 23, S32-S44.

[17]. Klavins M, Briede A, Rodinov V, Kokorite I, Parele E, Klavina I. (2000). Heavy metals in rivers of Latvia. Sci. Total Environ.262:175–183.

[18]. Kondakis, X.G.; Makris, N.; Leotsinidis, M.; Prinou, M.; Papapetropoulos, T. (1989). Possible health effects of high manganese concentration in drinking water. Arch. Environ. Health, 44, 75–178.
[19]. Mensing DM, Galatowitsch SM, Tester JR. (1998). Anthropogenic effects on the biodiversity of riparian wetlands of a northern temperate landscape. J. Environ. Manag.53:349–377.
[20]. Mohammed A. Alghobar., Lathamani Ramachandra and SidduraiahSuresha. (2014). Effect of sewage water irrigation on soil properties and evaluation of the accumulation of elements in Grass crop in Mysore city, Karnataka, India, American Journal of Environmental Protection, 3(5): 283-291.
[21]. Sakan SM, Dordevic DS, Manojlovic DD, Predrag PS. (2009). Assessment of heavy metal pollutants accumulation in the Tisza river sediments. J. Environ. Manag.90:3382–3390.
[22]. Smith E.J and Sykora J.L, (1976). Early developmental effects of lime-neutralized iron-hydroxide suspensions on brook trout and coho salmon. Trans. Amer. Fish. Soc. 105,308-312.
[23]. Sridhar Kumar A, K. Shnakaraiahb, P.L.K.M.Raoc and M. Sathyanarayana (2014). Assessment of water quality in Hussainsagarlake and its inlet channels using multivariate statistical techniques. International Journal of Scientific & Engineering Research, Volume 5, Issue 9.
[24]. Srinivas Ch., (2005). Impact of river Musi pollution on the fisheries of Edulabad reservoir, Ranga Reddy District, Andhra Pradesh, India. Ph.D. Thesis, Osmania University, Hyderabad.
[25]. Szefer P, Geldon J, Ali AA, Bawazir A, Sad M. (1997). Distribution and association of trace metals in soft tissue and byssus of molluscPernaperna from the Gulf of Aden, Yemen. Environ. Int.23:53–61.
[26]. Taylor, S.R (1964). Abundance of chemical elements in the continental crust: a new table, Geochim. Cosmochim. Acta, 28, 1273-1285.
[27]. Wasserman, G.A.; Liu, X.; Parvez, F.; Ahsan, H.; Levy, D.; Factor-Litvak, P.; Kline, J.; van Geen, A.; Slavkovich, V.; LoIacono, N.J. (2006). Water manganese exposure and children’s intellectual function in Araihazar, Bangladesh. Environ. Health Perspect.114, 124–129.
[28]. Woolf, A.; Wright, R.; Amarasiriwardena, C.; Bellinger, D. A (2002). child with chronic manganese exposure from drinking water. Environ. Health Perspect.110, 613–616.
[29]. Yip, R.; Dallman, P.R. Iron.(1996). In Present Knowledge in Nutrition, 7th ed.; Ziegler, E.E., Filer, L.J., Eds.; (ILSI Press: Washington DC., USA); pp. 277–292.

IOSR Journal of Pharmacy (IOSR-PHR) is UGC approved Journal with Sl. No. 5012

Sreenu Noothi. “Evaluation of CV Technology for reducing levels of heavy metals in polluted Hussainsagar lake water, Hyderabad, Telangana state, India.” IOSR Journal of Pharmacy (IOSR-PHR) , vol. 7, no. 9, 2017, pp. 18–23.