International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 02 Issue: 05 | Aug-2015 www.irjet.net p-ISSN: 2395-0072

CHARACTERIZATION OF BELLARY NALA AND ITS IMPACTS ON SOIL AND CROPS

Shilpa Kampli[1], Pradeepkumar M. Singa[2], Arjun S.Virupakshi[3]

[1] *M-Tech Student, Dept. of Civil Engineering, KLE Dr. MSSCET, Belagavi-590008 (Karnataka).*
[2] *Assistant Professor, Dept. of Civil Engineering, KLE Dr. MSSCET, Belagavi-590008 (Karnataka).*
[3] *Assistant Professor, Dept. of Civil Engineering, KLE Dr. MSSCET, Belagavi-590008 (Karnataka).*

Abstract - Due to Globalization fresh water for irrigation is major issue. Hence use of sewage and industrial discharges for irrigation purposes become alternative. The study deals in determining the characteristics of sewage and its effects on soil and crops. The sewage sample collection was done on every 15 days interval. Sewage samples were initially analyzed for pH, Iron, Zinc, Chromium, Nickel, and Lead, which were within permissible limits. Further Heavy metal analysis was carried out for Soil and Crops. Iron contamination was more in soil whereas Nickel contamination was more in crop.

Key Words: *Heavy metals, AAS, Irrigation, Sampling, etc…*

1. INTRODUCTION

With 66% of the world's surface available by water and the human body comprising of 75 percent of it, it is obviously clear that water is one of the prime components in charge of life on earth. Water courses through the area generally as it does through the human body, transporting, dissolving and renewing supplements and natural matter, while diverting waste material. Further in the body, it directs the exercises of liquids, tissues, cells, lymph, blood and glandular emissions. In spite of the past, our late created mechanical society has get to be unconcerned with this marvel of life. Our common legacy (waterways, oceans and seas) has been abused, neglected and contaminated [4].

Due to increase in population and rapid urbanization there is lack of water for drinking as well as irrigation. In order to maintain the global water balance, treated wastewater from various industrial and municipal sector can also be utilize for irrigation purpose.

1.1 STUDY AREA

The Bellary Nala runs through Belgavi city originating from the hills of Belgavi (Damne and Yellur) and flowing eastwards in the direction of the Markandeya River.The Bellary Nala is a piece of Deccan fields and lies between longitude 74° 30’ E and 74°40’ E and scope 15° 45’ N to 15°55’ N in the Belgaum region of Karnataka. The basin area is of about 108 sq. Km. (up to gauging site at Hudli) [3].

The Nala which was once a perennial stream carrying fresh water has now turned into a sewer drain all along its course of 30 Km. Since there are no sewage treatment plants and recycling facilities within the city area, the entire sewage is directed to Bellary Nala by Lendi Nala (which comes from city area sewage form major part of the city joins this Nala) which is linked through gutters and sewer lines [3].

1.2 TYPES OF SOIL

Soil is a term that has an extremely wide definition and indicates to a loose layer of earth that covers the surface of the planet. Soil is produced when rocks divided into their constituent parts. Because of the quantity of distinctive types of natural and mineral organizations, there are different varieties of soil that experiences different ecological pressures. Basically there are three types of soil, they are Clay soil, sandy soil and silty soil.

1.3 STATEMENT OF PROBLEM

Due to rapid industrialization and urbanization streams flowing along the cities are being contaminated due to discharge of untreated effluents. The surrounding agricultural lands along the stretch utilizes these wastewater to cultivate their crops leads to cause heavy metal contamination in soil as well as crops. The absence of administration of metropolitan sewage may prompt the ground water contamination because of sewage penetration, additionally agriculturalists are utilizing this sewage for growing crops which may have effect on soil quality.

1.4 Objectives of the study

a) To find characteristics of nala wastewater.
b) To find effect of nala wastewater on soil and comparison of characteristics of nala and normal soil.
c) To find effect of Sewage on crops.

2. Materials and Methodology

The quantity of samples to be collected varies with the extent of laboratory analysis to be performed. A sample volume between two and three liters is normally sufficient for a fairly complete analysis. The total number of samples will depend upon the objectives of the monitoring program. To achieve the objectives of the study, 6 sewage samples were collected from the study area by dip (or composite) sampling method during Pre-monsoon season of 2015 (January, February and March, April). The Soil samples were collected from two fields, which are too close to the Nala (Two agricultural fields are chosen near Halga Bridge and Kudachi) and where the problem of soil fertility was highlighted by farmers in the interview conducted. Specially prepared questionnaire was given to the people & their feedback was analyzed for the problem they face. The ground water & sewage samples were collected in clean polyethylene containers fitted with screw caps. Some parameters like pH and temperature were measured in the field at the time of sample collection and the other chemical parameters were analyzed in the laboratory.

2.1 Standards for Soil, Wastewater and Crops

Table 2.1: Standards for Wastewater according to CPCB

Sl.No	Parameter	CPCB STANDARDS
		Land for irrigation
1	Suspended solids mg/L, max.	200
2	pH value	5.5 to 9.0
3	Biochemical Oxygen Demand (3 day at 27^0), mg/L max.	100
4	Chemical Oxygen Demand, mg/l, max	250
5	Lead (as Pb) mg/l, Max	1
6	Zinc (As Zn.) mg/ l, Max	15
7	Nickel (as Ni) mg/l, Max	3
8	Iron (as Fe)	3
9	Total chromium (as Cr.) mg/l, Max.	2
10	Manganese (as Mn)	2

Table 2.2: Standards for soil [2]

Sl.No	Parameter	Standards(mg/kg)
1	Iron	9
2	Zinc	1
3	Nickel	75-150
4	Cadmium	3-6
5	Lead	250-500
6	pH	6.5-8.5

Table 2.3: Standards for crops[2]

Sl.No	Parameter	Standards(ppm)
1	Chromium	20
2	Zinc	20-100
3	Nickel	10
4	Cadmium	1.5
5	Lead	2.5

2.2 Atomic Absorption Spectrophotometer

Fig 2.1: Atomic absorption spectrophotometer

a. The respective hallow cathode of heavy metal was inserted.

b. The wavelength of respective heavy metal was set accordingly.
c. The supply of gas switched on and the flame ignited.
d. The flame color should appear bluish and changed to dark orange yellow after inserting the sample capillary into respective solution.
e. The calibration is done accordingly by inserting capillary into distilled water by respective standard solution.
f. The calibration curve plotted through computer GBC avanta version 1.33 software.
g. The concentration of samples were analyzed displayed and noted.

3. Results and discussion

3.1 pH analysis

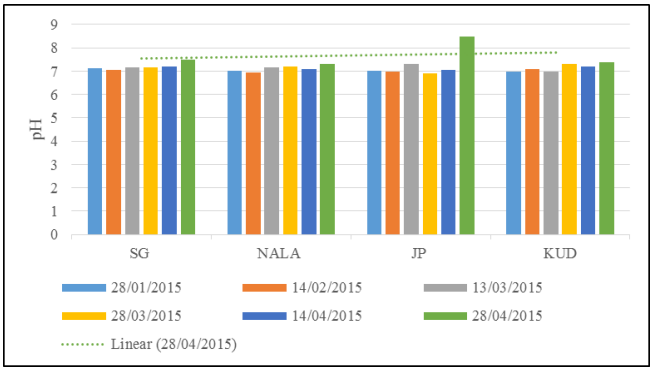

Chart 1: pH analysis of wastewater

The pH is measure of hydrogen ion concentration of water sample. From the above table and graph it is observed that the pH of wastewater almost alkaline in nature. And all the values are within range 6.5-8.5 according to standards. The highest pH value found at in the month of April in joining point. The wastewater sample was collected for every 15 days interval and it was observed that all the values lie within the range of 6.5-8.5 so there would be effect no effect on soil.

Table 3.1: SEWAGE HEAVY METAL ANALYSIS

Parameters (mg/L)	Sewage	Limits
Iron	2.84	3
Zinc	0.032	15
Chromium	0.94	2
Nickel	0.0056	3
Lead	0.878	1

The above table shows the results of heavy metal analysis carried out at joining point. As results are within the permissible limit, sewage can be used for irrigation.

3.2 CHARACTERSTICS OF SOIL SAMPLE:

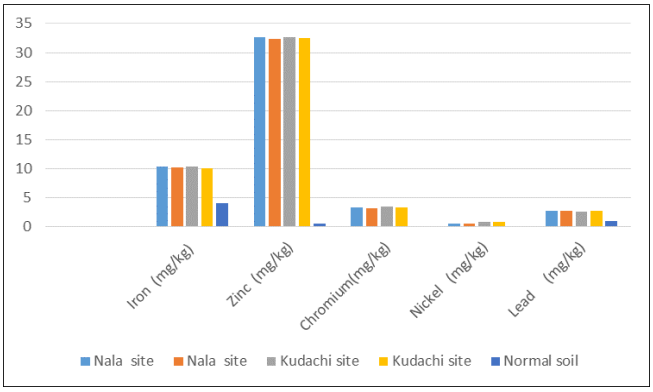

Chart 2: Soil sample analysis

The heavy metal concentration of soil is within permissible limits except iron and zinc which is slightly high. Excess amount of iron effects the human health causing rapid increase in pulse rate and coagulation of blood in blood vessel, hyper tension and drowsiness. Higher concentrations of zinc can be toxic to the organisms present in soil [8]. Due to continues usage of wastewater for irrigation purpose increased all the heavy metal concentration when compared to the normal soil and also continuous usage of wastewater to field may lead to accumulation of heavy metals in soil.

3.3 CHARACTERSTICS OF COLLETCED CROPS:

Table 3.2: Crop sample results

Parameters(mg/kg)	Carrot	Chilly
Cadmium	0.4	0
Chromium	17.35	17.25
Nickel	26.5	2.2
Lead	0	0

The results shows that the heavy metal “Nickel” is high in carrot than chilly. But all the heavy metals are below permissible limits expect Nickel and it causes blindness both in human and animals, increased blood sugar level, serum cholesterol and local necroses in the liver tissue.

Heavy metal "Nickel" was found more in carrot compared to chilly, as carrot is a root plant. From the results it can be observed that the concentration of chromium in carrot and chilly is not much difference it may be due to affinity of chromium towards soil is more. The contamination of heavy metals differs for species of plants which were irrigated by wastewater. Continuous consumption of these vegetables may effect human health in future.

4. CONCLUSIONS

a. As per CPCB standards the recommended pH values of wastewater for land irrigation ranges 5.5 – 9. The pH for all the four wastewater samples lie between 6.93-7.16.
b. The heavy metals (Fe, Zn, Cr, Ni, Pb) of wastewater sample are within the permissible limits.
c. The heavy metal analysis showed that Iron and Zinc exceeded the standards of Department of Agriculture and Co- Operation Ministry of Agriculture Government of India.
d. The heavy metal analysis of crops(carrot and chilly) showed that Nickel in carrot was beyond the limit according to Department of Horticulture, Guidelines for safe limit of heavy metals in soil and plant sample.

REFERENCES

[1] APHA.1992. Standard methods for the examination for the examination of water and wastewater. 18th Edition, Washington, DC.
[2] Department of Horticulture, Guidelines for safe limit of heavy metals in soil and plant sample.
[3] Praveen Ghorpade (2008), *"Effect of municipal sewage on ground water and soil quality"-A case study,* M.tech thesis.
[4] FAO Corporate Document Repository, Produced by: Natural resources Management and Environment Department, title: wastewater treatment and use in agriculture.
[5] P.K. Singh, P.B. Deshbhratar, D.S. Ramteke (2012), *"Effects of sewage wastewater irrigation on soil properties, crop yield and environment",* Agricultural Water Management, vol 103, pp100– 104.
[6] R.K. Yadav, B. Goyal, R.K. Sharma, S.K. Dubey, P.S. Minhas (2002), *"Post-irrigation impact of domestic sewage effluent on composition of soils, crops and ground water—A case study",* Environment International ,vol28 ,pp 481– 486.
[7] R.K. Rattan , S.P. Datta , P.K. Chhonkar , K. Suribabu , A.K. Singh (2005), *"Long-term impact of irrigation with sewage effluents on heavy metal content in soils, crops and groundwater—a case study",* Agriculture, Ecosystems and Environment, vol(109) ,pp310–322.
[8] A. P. Gupta, R. P. Narwal & R. S. Antil (1998), *"Sewer Water Composition and its Effect on Soil Properties",* Bioresource technology, vol(65),pp171-173.
[9] Ram Bharose, S.B. Lal, Sudhir K Singh and Prashant K Srivastava (2013), *"Heavy metals pollution in soil-water-vegetation continuum irrigated with ground water and untreated sewage"*, Bulletin of Environmental and Scientific Research, Vol(2),pp1-8.