ANALYSIS OF HEAVY METALS PRESENT IN EFFLUENT OF SUGAR INDUSTRY

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Abstract: Heavy metals like Zinc, Nickel, Copper, Manganese, Cadmium, Chromium, Iron, and Lead are the major pollutants of the environment that accumulate in soil and adversely affect plant growth as well as human health. In the present study, the researcher pointed out the heavy metal pollutants concentration in the sugar industry effluent. The study reveals that the high concentration of heavy metals like Nickel, Cadmium, Chromium, and Lead are a serious threat to human health and the environment. Precaution and proper treatment of effluent must be followed before discharging into the natural source. According to CPCB's (Central pollution control board) direction, every industry should adopt zero liquid discharge (ZLD) in their premises to avoid discharge of effluent without treatment.

Key Words: Heavy metals, Sugar Industry Effluent, Pollutants, CPCB, ZLD.

I. INTRODUCTION

In the developing countries establishment of new industries in all sectors created environmental pollution more noticeable. The industrial effluents' containing organic compound inorganic complexes and other Non-biodegradable substances contaminate water and soils of nearby lands [1]. Heavy metals present in industrial waste easily enter the food chain when it comes in contact with water, soil, and plants which are used for food production. Heavy metals are toxic in nature and create many health problems [2-3].

India is also a fast developing country. It is the largest producer of sugar in the world. The sugar industry plays an important role in the economic development of our country. The sugar factory effluent discharged into the environment poses a serious health problem to the rural and semi- urban populations that use stream and river water for agriculture and domestic purposes. Heavy metal toxicity reduces plant growth [4], although the wastewater is used for the cultivation of crops because it contains many nutrients.

The present paper deals with the analysis of heavy metals of sugar industry effluents collected from the KisanSahkariChini Mills limited, Satha of Aligarh district. The study was conducted during the winter season (December to March, 2021) when the sugar mill was working at its full capacity.

II. EXPERIMENTAL

The effluent samples were collected in pre-cleaned plastic bottles from the exit point of drains of the sugar factory located at Satha, Aligarh district of Uttar Pradesh. The collected effluent was stored at 5 °C to maintain its original characteristics. Filtered the effluent sample through 0.45µMillipore filter paper and acidified with 10 ml HCL maintaining pH 4-5. The acidified effluent is stored in a 1- liter polypropylene flask. Added 40 ml of MIBK followed by 7 ml of 1% ADPC solution. Equilibrate the mixture on a mechanical shaker for 30 minutes. Separate the organic layer in a separating funnel and store in a polypropylene bottle. The Aqueous layer is used to prepare the standard solution and was analyzed for the determination of heavy metals like Zn, Ni, Cu, Mn, Cd, Cr, Fe, and Pb by AAS (ATOMIC ABSORPTION SPECTROMETER (PERKIN-ELMER 100).

III.   RESULT AND DISCUSSION

The colour of the effluents is yellow in nature but intensity decreases as it covers the distance from the exit point. The odor of effluent was found sweet to an alcoholic. The pH of the effluent sample is 6.34 which are under the permissible limit of 5.5 to 9.0 for the effluent that could be released into any natural water source [5].

The heavy metal concentration of an effluent was shown in table 1.

The Zinc (Zn) concentration of the effluent is found at 1.48 mg/L which is under the permissible limit. It is an essential micronutrient that regulates the several metabolic processes of plants and animals [6].

The Nickel (Ni) concentration in the sugar mill effluent is found 0.13 mg/L which is slightly excess than the permissible limit. Nickel is a nutritionally essential trace element for a few animal species, micro-organisms, and plants.

The concentration of Copper (Cu) in sugar mill effluent is found at 0.17 mg/L which exceeded the maximum tolerance level as per Indian standards.

The concentration of Manganese (Mn) in sugar mill effluent is found 0.08 mg/L which is within the permissible limit as per Indian standards. However, it is also toxic when consumed in high concentrations [7].

The Cadmium (Cd) and Chromium (Cr) concentration in the effluent are found at 0.02 mg/L and 0.06 mg/L respectively which is slightly excess of the permissible limit. They are the most dangerous pollutants due to their high toxic effects [8].

The Iron (Fe) concentration in sugar mill effluent is found at 3.21 mg/L which exceeds the permissible limit as per Indian standards.

Effluent analysis of sugar mill indicates the lead concentration 0.06 mg/L which exceeds the permissible limit as per Indian standards [9]. Person with prolonged exposure to lead may be at risk for high blood pressure, kidney disease, heart disease, and reduced fertility.

Table 01: Concentration of heavy metals in sugar industry effluents

S.No.	Parameters	Unit	Values	Permissible Limits (IS)
1	Zn	mg/L	1.48	5
2	Ni	mg/L	0.13	0.05
3	Cu	mg/L	0.17	0.05
4	Mn	mg/L	0.08	0.1
5	Cd	mg/L	0.02	0.01
6	Cr	mg/L	0.06	0.05
7	Fe	mg/L	3.21	0.3
8	Pb	mg/L	0.06	0.1

IV.   CONCLUSION

On the basis of the above discussion, it is obvious that the long - term use of sugar industry effluents for irrigation may increase the concentration of heavy metals Zinc (Zn), Nickle (Ni), Copper (Cu), Manganese (Mn), Cadmium (Cd), Chromium (Cr), Iron (Fe), and Lead (Pb) in surface soil. The present study reveals that the sugar mill effluent is regularly treated in a treatment plant before discharging into a natural water source. Although the maintenance of the treatment plant as well as the periodic training of the concerned technicians is required.

V.　　ACKNOWLEDGEMENT

VI.　　REFERENCES

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