

Heavy Metal Contamination of River Ganges: Detection of Ten Heavy Metals by Inductively Coupled Plasma Atomic Emission Spectroscopy

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Aims and objectives

To screen River Ganges that flows through Varanasi and Allahabad for the presence and concentration of ten heavy metals (arsenic, mercury, iron, manganese, zinc, copper, cadmium, chromium, lead and nickel) by inductively coupled plasma atomic emission spectroscopy (ICP-AES).

Materials and methods

Water samples were collected from selected locations of the River Ganges, digested with nitric acid and perchloric acid, and subjected to heavy metal estimation by ICP-AES.

Observations

A total of 13 samples were collected from different places along the River Ganges, and tested for pH, turbidity, and TDS value, followed by secondary screening for the following heavy metals - arsenic, mercury, iron, manganese, zinc, copper, cadmium, chromium, lead and nickel. The pH was mostly alkaline (7.11-8.53), TDS values ranged from 330 to 530, and turbidity was obtained in the range of 1 to 11 nTU. The following metals were detected at high concentrations - iron, manganese, zinc, copper, arsenic, mercury, chromium and lead (values: 6.066-288.7 ppm, 0.16-0.33 ppm, 12.195-985.57 ppm, 0.23-0.497 ppm, 0.163-0.494 pm, 0.13-0.329 ppm, 0.337-4.05 ppm, and 0.16-0.18 ppm

respectively). Cadmium was not detected in any sample, where as arsenic (0.001-0.003 ppm) and mercury (0.003-0.032 ppm) was detected only in a few samples.

Conclusion

River Ganges is contaminated with a number of heavy metals, of which high concentrations were observed with regard to iron, manganese, zinc, copper, arsenic, mercury, chromium and lead. This poses serious environmental and health concerns, and needs to be addressed urgently by way of proper treatment and decontamination. Permissible Limits for Various Metals in Drinking Water.

Metal	Symbol	Prescribed Limit (ppm)
Arsenic	As	0.05
Cadmium	Cd	0.005
Chromium	Cr	0.05
Copper	Cu	0.05
Iron	Fe	0.3
Lead	Pb	0.05
Manganese	Mn	0.1
Mercury	Hg	0.001
Nickel	Ni	-
Zinc	Zn	5.0

Reference

This is as per Indian Standards (LIMIT IS10500; 1991 IS13428; 1998).