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Study of sulphate concentration of Pavana River at Pune: A case study

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Abstract
Pavana River in Pune (India) is one of the important water bodies to pollution because of the role played by the river in carrying municipal and industrial wastes and run-off from agricultural lands in their basin. In spite of various rules and regulations various small scale industries are discharging their wastes directly into the river body. The present investigation focus on study of sulphate concentration of Pavana River water for the year 2015-16. For this study eight sampling stations were selected on the course of river. The results obtained were compared with the standard desirable limit values of drinking water given by WHO. The present study shed light on the quality of river water samples for various usages of the river water to all.

Keywords: Pavana River, Sulphate concentration, agricultural run-off, agrochemicals

1. Introduction
Rivers are the systems of surface water which carry the entire load of materials in the dissolved and undissolved things from both natural as well as anthropogenic sources in one direction only [1]. Sewage waters, Hospitals, Human activities, and use of various agrochemicals are some of the major factors which influence surface water quality [2, 3]. Now a day's Pavana river is affected by the excessive use of agrochemicals/ agricultural run-off and organic pollutants which are directly discharged into the water body. The Pavana river originates from Lonavala and flows near about 60 kilometers to meet the river Mula-Mutha in Pune. The river is crossing the cities Pimpri-Chinchwad and Pune. Before its confluence with the Mula river near Sangvi, it passes through the suburbs of Dehu and Dapodi. The river is reported to be severely polluted, causing the civic activists to blame the governing body for not taking appropriate steps to limit the degradation. Accumulation of silt and discharge of untreated industrial waste are the major factors of pollution of the river, and has made the river water unusable [4-6].

Hectic industrial activity in Pimpri Chinchwad has pushed up industrial waste is flushed into its water bodies has added to their filth, with Pavana river emerging as the most polluted of the three rivers flowing here. Rise in pollution levels in the Pavana, Mula and Indrayani rivers, but Pavana, which covers a distance of 20 km in the city, has emerged as the most polluted of the three rivers. The environment status report of Pimpri-Chinchwad Municipal Corporation (PCMC) says the Pavana River is highly polluted compared to other rivers flowing through the industrial town. The report also says the oxygen level in the river has gone down drastically and that the Indrayani and Mula rivers are less polluted.

Sulfate minerals can cause scale buildup in water pipes similar to other minerals and may be associated with a bitter taste in water that can have a laxative effect on humans and other animals [7, 8, 9]. Elevated sulfate levels in combination with chlorine bleach can make cleaning clothes difficult [10]. Sulfur-oxidizing bacteria produce effects similar to those of iron bacteria. They convert sulfide into sulfate, producing a dark slime that can clog plumbing and/or stain clothing [11, 12]. Blackening of water or dark slime coating the inside of toilet tanks may indicate a sulfur-oxidizing bacteria problem. Sulfur-oxidizing bacteria are less common than sulfur-reducing bacteria [13].

Sulfate may have a laxative effect that can lead to dehydration and is of special concern for infants [14-15]. With time, people and young livestock will become acclimated to the sulfate and the symptoms disappear. Sulfur-oxidizing bacteria pose no known human health risk. The Maximum contaminate level is 250 mg/L.

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2. Materials and Methods
2.1 Experimental
The water samples were collected in the period 2015 and 2016 (second half of every month). The samples were of grab samples and collected in sterilized bottles using the standard procedure in accordance with the standard method of American Public Health Association (1995). Spectrophotometer Digital Systronic Range 340 to 960 µ/m was used for analysis and chemicals used were of analytical grade [16-17]. For this study the area is confined to stretch of Pavana Dam. In case of Pavana river heavy load of agriculture run-off and it receives heavy loads of domestic sewage which is organic and it is a waste of biological oxygen demand. From this river, sampling stations were selected to give a reasonable comparison of rivers quality. For the present study eight sampling stations were considered which are as follows.

Table 1

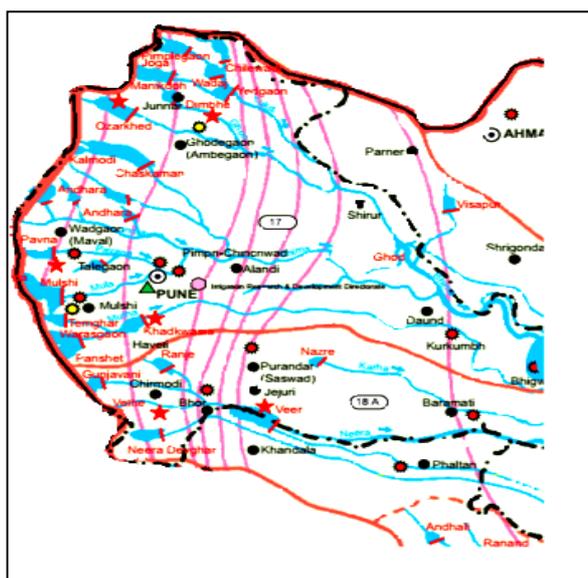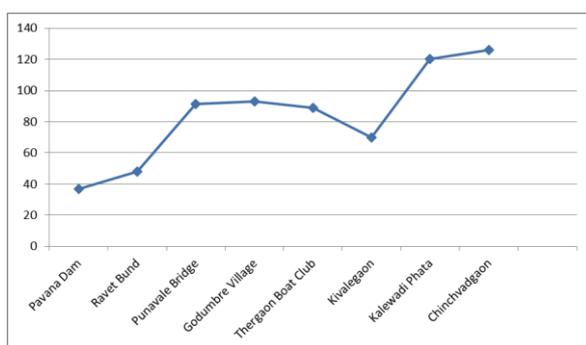| Sr. No	Sampling Station	Observed Value
1	Pavana Dam	37 mg/L
2	Ravet Bund	47.83 mg/L
3	Punavale Bridge	91.15 mg/L
4	Godumbre Village	93.10 mg/L
5	Thergaon Boat Club	89 mg/L
6	Kivalegaon	69.87 mg/L
7	Kalewadi Phata	120.32 mg/L
8	Chinchvadgaon	126 mg/L

Fig 1: Map of Pavana River

Fig 2: Graphical Representation of Sulphate Concentration

3. Results & Discussion
Sulphates occur naturally in water as a result of leaching from gypsum and other common minerals. It also occurs as the oxidized state of organic matter and which in term is a source of energy for sulphate bacteria. Sulphates may also come from numerous industrial wastes such as paper, tanneries, textiles etc [18]. It was observed that values of sulphates were in the range of about 37 mg/l at Pavana Dam, while higher values recorded at Thergaon very close to paper mill showed as high as 89 mg/l indicating leaches from the paper industry. While higher values downstream water samples were in the range of 126 mg/l. The highest values were at Chinchvadgaon indicating degradation of organic matter. There was a fluctuation in the values of sulphate from month to months as also at various locations. The annual maximum average concentrations of sulphate 126 mg/l have been reported at sampling station Chinchvadgaon, while minimum values 47.83 mg/l was found at sampling station Ravet Bund clearly indicates higher sulphates were due to organic matter. The sulphate concentrations increase at the sampling stations, where the effluents from industries are discharged into the river. Another reason in increase sulphate concentration may also be due to human activities along the riverbank, leaching from fertilized, irrigated agricultural land, discharge of domestic wastes and higher concentration of organic matter.

4. Conclusion
Increasing Water pollution is a major problem in all the rivers. Contaminated water is the biggest health risk and continues to threaten both quality of life and public health. From our analysis on Pavana River we concluded following points:
- The analysis and result clearly shows that river water quality has deteriorated mainly due to domestic sewage and industrial effluents.
- It is clear from the present analysis that the environment of the Pavana River showed increasing load of pollution. There is need to have proper collection and treatment of waste and need to regulate the flow.

5. References
1. APHA. (American Public Health Association) American water works Association and water pollution control filtration. Standard methods of examination of water and waste water 19th Edition, New York U.S.A. 1995.
2. De AK. The Saga of the Damodar River. J. Indian Chem. Soc. 1985; 62:1038.
3. Chaurasia M, Pandey GC. Study of physicochemical characteristic of some water pond of Ayodhya –Faizabad. Indian J. of Environmental protection. 2007; 27(11):1019-1023
4. Hegde GR, Bharati. Comparitive phytoplankton ecology of freshwater ponds and lakes of Dharwad, Karnataka state, India. Proc. Nat. Symp. Pure and Appl. Limnology. Bull. Bot. Soc. Sagar. 1985; 32:24-29
5. Kataria HC, Singh A, Pandey SC. Studies on water Quality of Dahod Dam, India. Poll. Res. 2006; 25(3):553-556
6. Manivasakam N. Physicochemical examination of water sewage and industrial Effluent, 5th ed. Pragati Prakashan Meerut, 2005.
7. Singh P. Physico-Chemical characteristics of a tributary of Mahanadi river near orient paper mills site with ref. To water pollution J. of Env. Poll. 2001; 8(3):237.

8. Pandey GN, Carney GC. Environmental Engg. Tata McGraw Hill Publishing Company Limited, New Delhi, 1998.
9. Trivedi; Assessment of water quality of some Indian Rivers based on factor analysis, RK.
10. Samiksha Chaturvedi Dineshkumar, Singh RV. Res. J. Chem. Environ. 2003; 7(3).
11. Sharma DK, Jangir JP, Chandel CPS, Gupta CM. J. Indian water works Association. 1988, 57.
12. Sahasranaman A, Buljan J. Environment Management in India tanneries in 34th, Leria, 2000, 27-30.
13. Jadhav SD, Jadhav MS *et al*. Water Quality Assessment of Katraj Lake, In Pune City. National Environmental Science Academy, Bulletin New Delhi. Dec, 2007, 337-340.
14. Shobha C, Praveen J, Chaturvedi R. Evaluation of drinking water quality of Kolar dam water, near Bhopal Madhya Pradesh. Poll. Res. 1996; 15(3):241-243.
15. Jadhav SD, Jadhav MS. Water quality evaluation and water quality index of Krishna River near Karad Tahsil, Dist Satara, (M S India) International Journal of Chemical Studies. 2016; 4(5):94-97. P-ISSN2349-8528 E-ISSN 2321-4902
16. Kudesia VP. Water pollution. Pragati Prakashan, Meerut, 1985.
17. Venkatesharaju k, ravikumar P, somashekar RK, prakash KL. Physico-Chemical and Bacteriological Investigation on The River Cauvery of Kollegal Stretch in Karnataka, kathmandu university journal of science, engineering and technology. 2010; 6(I):50-59
18. WHO. Guidelines for Drinking water Quality, 2nd Edition, 1996.