Effect of drain effluents on hardness of water of the ponds of Varanasi

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ABSTRACT : Water is necessity of all living being, it helps in the digestion of food as well as provides necessary minerals required to the body. But, harden water has its demerits on human life both ways for drinking as well as for normal use. The soap consumption requires a high budget and accumulation of harmful metals in excess may damage the human health. In ponds there are greater chances of heavy metals like Ca, Ba, Sr, Mg, Fe etc. which are conveyed to ponds through drains. The quantitative monitoring of such heavy metals which render hardness to ponds water is essential. In the present dissertation periodic estimations of Varanasi city have been made and the utility results have been drawn their from. In the undertaken study sites the heavy metals except Ca were obtain in extremely trace amounts.

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When toxic substances enter lakes, stream, rivers, ocean, ponds and other water bodies they get dissolved or lie suspended in water or get deposited on the bed. This result in the pollution of water whereby the quality of the water deteriorates, affecting ecosystem. The pollution affects the environment in many ways (Nishad *et al.,* 2006).

Water pollution has many source, the most polluting of them are the city sewage and agricultural waste discharged into the ponds. The facilities to treat waste water are not adequate in any city in India. Presently only about 10 per cent of the waste water generated is treated, the rest is discharged as it into our water bodies. The hydrological significance of water reservoirs had been attracting the attention of the investigators since past (Known *et al.*, 2009; Rodda,1994

and Karan *et al.,* 2008).

Due to this, pollutants enter ground water, rivers and other water bodies. Such water, which ultimately ends up in our household, is often highly contaminated and carries disease causing microbes. Agricultural run-off or the water from the fields that drains into rivers is another major water pollutant as it contains fertilizers and pesticides. The effect of water quality on human health had always been a deep concern to scientist (Peggy and Share, 2000; Jennifer, 2008 and Singh *et al.,* 2004). Hardness in pond water is due to the presence of divalent Cations. Total hardness is usually the measure of the hardness caused due to Ca and Mg concentration. A group of workers has exhaustively studies the variation of ponds water quality and its applications (Down *et al.*, 2000) and Lisuzzo *et al.* (2008) water resources and management (2006).

In Varanasi some eminent scientists have reported the sewage discharge problem into ponds, the soil contamination by heavy metal after sewage irrigation and uptake of heavy metal in cereal and vegetable Crops. The closeness of water to forming had been appreciated by agricultural scientist (Kurtulus *et al.*, 2009; Wang *et al.,* 2008 and Husange *et al.,* 2000).

Experiment :

Water samples were collected in air-tight plastic cans following standard procedure in four seasons *viz.,* summer (June), autumn (September), winter (December) and spring (March) during year 2008 and 2009. Water samples for two ponds were collected and analyze for Fe, NO_3^-, Cl^-, DS (Dissolved Solid) hardness of water by using standard method (Singh and Singh, 2009 and 2007).

EXPERIMENTAL METHODOLOGY

The samples were analyzed for the five major parameters shown in Table 1-4 . Each of the pond water samples were analyzed for Iron, Nitrate by standard color chart method, Chloride by calculation method, dissolved solid by electrical conductivity method and hardness measure by EDTA method.

EXPERIMENTAL FINDINGS AND DISCUSSION

The result obtained shown that the Fe content value of water samples ranged from 2.68- 4.58 mg/l (Feb) in

Table 1: Water parameter in Bhabhniaw pond in year 2008

Water parameter	Bhabhniaw pond, 2008											
	Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Fe	2.68	2.73	2.81	0.28	0.35	0.38	0.34	0.32	0.30	0.29	0.27	0.24
NO_3^-	71.7	76.5	77.2	78.8	81.9	82.6	68.4	62.3	100	110.2	118.1	120.1
Cl^-	30.2	31.1	32.4	32.8	33.1	34.2	33.2	32.6	32.5	32.3	31.8	31.2
DS	1.58	1.51	1.96	2.10	2.40	3.20	4.60	5.30	5.80	6.20	5.90	1.53
Hardness	172.2	210.3	218.8	235.7	180	298.7	318.6	365.8	400	410.2	415.3	413.6

Table 2 : Water parameter in Ashapur pond in year 2008

Water parameter	Ashapur pond, 2008											
	Jan.	Feb.	March.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Fe	2.61	2.68	2.36	0.42	0.46	0.38	0.36	0.31	0.30	0.34	0.36	0.38
NO_3^-	65.51	70.41	72.11	73.41	80.11	76.61	62.31	56.11	93.21	102.4	112.2	114.4
Cl^-	24.52	26.35	26.98	27.04	27.61	28.63	32.5	26.67	25.80	25.89	26.20	26.64
DS	4.32	4.46	4.39	4.82	4.98	5.0	5.88	6.82	6.37	7.71	8.87	9.31
Hardness	157.7	169.8	205.4	222.7	221.6	302.7	333.4	326.5	341.4	401.6	407.7	399.8

Table 3 : Water parameter in Bhabhniaw pond in year 2009

Water parameter	Bhabhniaw pond, 2009											
	Jan.	Feb.	March.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Fe	3.18	3.23	3.31	0.78	0.85	0.88	0.84	0.82	0.80	0.79	0.77	0.74
NO_3^-	72.2	77.0	77.7	79.3	81.4	83.1	68.9	62.8	100.8	115.2	118.9	120.6
Cl^-	29.24	30.68	31.9	32.3	32.6	33.7	31.7	32.1	32.0	31.8	31.3	30.7
DS	1.08	1.01	1.46	1.6	1.9	2.7	4.1	4.8	5.3	5.7	5.4	1.03
Hardness	171.7	209.8	218.9	235.2	179.5	298.2	318.1	365.3	399.5	410.2	414.8	413.1

Table 4: Water parameter in Ashapur pond in year 2009

Water parameter	Ashapur pond, 2009											
	Jan.	Feb.	March	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Fe	4.51	4.58	2.26	2.32	2.36	2.28	2.26	2.21	2.20	2.24	2.26	2.28
NO_3^-	67.5	72.4	74.1	75.4	82.1	78.6	64.3	58.1	95.2	104.4	114.2	116.4
Cl^-	27.52	29.35	29.98	30.04	30.61	31.63	35.50	29.67	28.8	28.9	29.0	
DS	3.32	3.46	3.39	3.82	3.98	4.0	4.88	5.82	5.37	6.71	7.81	8.31
Hardness	158.6	170.8	206.4	223.7	222.6	303.7	334.4	327.5	342.4	402.6	408.7	400.8

2008-09 and minimum value 0.30-2.20 mg/l (Sept.) in water sample WA1 or Ashapur pond while in another sample WA2 or Bhabhniaw pond the Iron parameter ranges throughout the year from 2.81-3.31mg/l (March) and lower value 0.24-0.74mg/l (Dec.).The higher value of nitrate in water sample WA1 114.41-116.4mg/l and lower value ranges from 56.11-58.1mg/l (Aug.) in another water sample WA2 these value 120.1-120.6 Mg/l (Dec.) and minimum value 62.3-62.8 mg/l (Aug.) indicate higher level of Iron in fish and aquatic plant also has negative effect on the people or creature consuming them. High concentration of nitrate in water interfere the ability of our red blood cells to carry oxygen.

The chloride content show the higher value in WA1 sample 32.50-35.50mg/l (July) and lower value 24.52-27.52 mg/l (Jan.) while the WA2 water sample these value ranges from 33.128-32.6 mg/l (May) and lower value 30.2-29.24mg/l (Jan.). High level of chloride can damage plants.

The dissolve solid value in water sample WA1 show the higher range from 9.31-8.31mg/l (Dec.) and lower value 4.32-3.32mg/l (Jan.) in other water sample these value 6.2-5.7mg/l (Oct.) and minimum value 1.51-1.01mg/l (Feb.). The hardness of pond water sample WA1 show the highest value from 407.7-408.7mg/l (Nov.) and the minimum value 157.7-158.61mg/l (Jan), other water sample WA2 these maximum value where 415.3-414.8mg/l (Nov.) and lowest value ranges from 172.2-171.7mg/l (Jan.)

The physical parameter such as Fe, NO_3^-, Cl^-, DS and hardness decides the overall quality standard of water. These parameters are quite basic and have vital significance that they decide the physico-chemical and biological characters of water. Moreover, these properties form the backbone to decide the degree of portability of water whether it is desirable, agreeable, disagreeable or totally rejectable.

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