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Studies of Physico-Chemical Status of the Various Ponds and Streams at R.S.Pura Tehsil under Anthropogenic Influences

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Abstract
Water samples were collected from different sources i.e ponds, streams and ditches in 30 selected sites of tehsil R.S.Pura. The samples were analysed for 8 parameters such as temperature, pH, turbidity, dissolved oxygen, free carbon dioxide, chloride, hardness, alkalinity. The results obtained were compared which showed that with only a few locations with selected sites gave unsatisfactory results while most of the results were found within the permissible range. The quality of water, in some parts of the area was found unfit for drinking purpose and needed pretreatment processes. Gradual decrease in water quality was observed to be due to human and animal activities in the surveyed areas.

Keywords: turbidity, unsatisfactory, permissible, pretreatment

Introduction
Water is one of the most important natural resource available to mankind. Knowing the importance of water for sustenance of life, the need for conservation of water bodies especially the fresh water bodies is being realized everywhere in the world. The role of water in nature is unique not only from the point of human consideration; even the numerous organisms make aquatic medium their abode. Understanding such aquatic life requires a sound knowledge not just for organisms themselves but also of those of external influences of the medium that affect them. The physical and chemical properties of fresh water bodies are characterized by the climatic, geochemical, geomorphological and pollution conditions. The quality of aquatic life depends on the water quality. In order to utilize fresh water bodies successfully for fish production, it is very important to study the physico-chemical factors which influence the biological productivity of the water body. In the recent year, a remarkable contribution is made in this field. Several studies have been made on the limnology of fresh water bodies in India (Naganandini and Hosmani, 1998; Pandey *et. al*., 2000; Patil and Tijare, 2001 and Gupta and Shukla, 2006). Not much information is available on physicochemical parameters and aspects pertaining to village water bodies used for culture of Indian major and exotic carps. Hence, the present account is an attempt to study detailed information on some important physico-chemical parameters of some water bodies of R.S.Pura.

Materials and Methods
Area of study
Tehsil R.S.Pura (Plate 1, Fig a, b) lies between 32.63^0 N latitude and 74.73^0 E longitude. It has an average elevation of 270m (886 feet). It is located 21 km towards South from district headquarters Jammu.
At one side R.S.Pura tehsil is bounded by Pakistan and at other side bounded by Khour tehsil, Bishnah tehsil and Satwari tehsil. This place is also bounded by Jammu District and Samba district.

Collection and Storage of Water Samples
Water samples were collected during morning hours in between 8.30 a.m. to 11.30 a.m. in one litre glass stopper sterile bottles and immediately transferred to the laboratories for analysis. Some of the parameters such as transparency and temperature were however, analysed on the spot itself whereas the others were recorded in the laboratory following the standard methods of Trivedi and Goel (1986) and APHA (2005) and compared with standard values of aquaculture pond water (Boyd,1998).

Results and discussion

Abundance and diversity of biotic communities are known to be influenced by various physicochemical parameters prevailing in the aquatic ecosystem. Biological and physicochemical methods are complementary and are needed for a full assessment of an aquatic ecosystem. The average values for different physicochemical parameters recorded during present study were depicted in table-1, 2 and 3.

Temperature

The lentic and lotic water bodies of R.S.Pura registered a variation in the air temperature from 20 ^{0}C to 36 ^{0}C (table-1, 2 and 3). While water temperature was found to vary from 19 ^{0}C to 32 ^{0}C. Water temperature was found to follow the changes in air temperature and the present findings were in agreement with those of Rangarajan, 1958; Chandramohan and Satyanmyana Rao, 1972; Sundararaj and Krishnamoorthy, 1981; Mishra *et al.,* 1993, Manjare *et al*., 2010 and Murehkar, 2011.

pH

One of the important parameters for determining the quality of water in an aquatic environment is the pH. During the present study, pH values ranged from 6.7 to 8.4 thus revealing the alkaline nature of these water bodies except at Gagian, Kirpind, Fattuchak and Kotli which indicated the slightly acidic nature (Table 1, 2 and 3).

Transparency

Structure of aquatic ecosystem is directly related to the solar radiations which heats and lights the water (Goldman and Home, 1983). The various water bodies of R.S.Pura recorded the transparency values ranging from 16.5 cm to 85cm during the period of study (table 1, 2 and 3). Comparatively high transparency values may be due to low level of total suspended solids, acidic pH and absence of thick growth of algae (Singh, 2005). Bright sunlight might be the reasons for slightly increased transparency values recorded during the study periods. Lowest transparency values recorded during study period may be due to the influx of surface run off from nearby catchment areas (Nair and Prabhoo, 1980; Harikrishnan and Aziz, 1989).

Dissolved Oxygen

The distribution of oxygen in the aquatic medium is governed

- by diffusion
- from air,
- photosynthesis of micro- and macrophytes,

And loss due to respiration, chemical and biotic oxidation.

DO values for the different water samples collected during the present study showed a minimum value of 1.6mg/l and a maximum value of 6.44mg/l. The values for most of the water samples were found to be much below the permissible limit recommended by WHO (table 1, 2 and 3). Such low dissolved oxygen content recorded during present study may be due to a high pollution load from nearby catchment areas, high decomposition of organic matter and addition of a variety of biodegradable pollutants from domestic and industrial sources as has already been discussed by Jameel, 1998 and Gupta *et al*., 2011.

Table 1: Showing average values of various physicochemical parameters of lotic water bodies of R.S.Pura.

P parameter	Sai	Biaspur	Kothey	Kirpind	Kalyana	Kool	Gandli	Salehar	Hansachak	Rathana	Salamechak	Jindlehar	Gagian	Behlol
E Colour	Brown	brown	Reddish brown	Blackish brown	brown	Brown	Brown	Brown	Brown	Brown	Brown	Greyish brown	Blackish brown	Reddish brown
Air temp. (℃)	31.5	32	32	34	34.2	35	36	34	26	33	33.5	34	22	34
Water temp. (℃)	28	28	29	28	29	29	29	28	22	27	27.5	28	20	26
Tt Transparency (cm)	57.5	80	34	26	50	40	33	23	42	31	39	46	25	85
pH	7.6	7.4	6.9	6.7	7.2	7.2	7.3	7.6	6.8	7.1	7.2	7.2	6.9	7.5
DO (mg/l)	2.7	4	4	2.8	4.2	5.3	5.5	4.8	1.6	6.2	6.44	6	2.1	6
FCO_2(mg/l)	2.9	5.9	12	13.7	9	8.2	6.4	5.6	12.6	5.2	6.2	4.7	13.4	4.5
HCO_3^{2-}(mg/l)	219.6	248.88	293.4	402.6	366.02	390.4	268.4	158.6	496.57	183.2	146.4	329.4	392.64	518.5
CO_3^{2-}(mg/l)	Ab.	Ab.	Ab.	Ab.	Ab.	Ab.	Ab.	Ab.	Ab.	Ab.	Ab.	Ab.	Ab.	Ab.
Ca^{2+}(mg/l)	22.04	24.04	33.06	14.008	10.02	10.02	8.01	18.03	24.84	14.02	16.032	10.82	82.42	33.06
Mg^{2+}(mg/l)	12.15	13.25	18.05	36.45	25.51	21.87	21.87	36.45	29.52	24.32	29.16	24.30	48.62	35.23
Cl^- (mg/l)	18.52	17.51	18.46	22.02	15.02	15.01	17.51	10.11	15.01	15.01	10.01	4	54.6	45.04

Carbon dioxide

The respiration of aquatic biota, decaying organic matter, ground water, and bicarbonate salts are the major sources of carbon dioxide in aquatic systems. It may occur in the Free State and tends to vary inversely with oxygen. The carbon dioxide values for different water samples recorded a minimum value of 1.2mg/l to a maximum value of 13.9mg/l (table 1, 2 and 3). High values of carbon dioxide which may be due to decay and decomposition of organic matter, surface run off and addition of drainage, indicates an increase in pollution load (Chandraprakash *et al.,* 1978; Shah, 1988).

Alkalinity

Water alkalinity is a measure of acid present in water and of the cations balanced against them (Shastri and Pendse, 2001).The total alkalinity at the different water bodies fluctuated between 146.4 to 531.92mg/l indicating that the water is hard. These results tallied with those of Maruthanyagam *et al.* (2003) and Murhekar (2011). Das and Pandey (1978) opined that high alkalinity indicates pollution. Rainfall and the subsequent surface run off and leaching may be the major factors responsible for increase in total alkalinity (Girijakumari, 2007).

Table 2: Showing average values of various physicochemical parameters of lentic water bodies of R.S.Pura

Parameters	Sheikechak	Barshalpur	Rakh	Tarpalpur	Dablehar	Khannechak	Fattuchak	R.S.Pura town
Colourof water	Greenish brown	Brown	Brown	Brown	Greenish brown	Brown	Brown	Dirty Brown
Air temp.(°C)	32	29	32	32.5	25	22	26	28
Water temp.(°C)	27	21.5	28	27	22	19	25	26
Transparency(cm)	32.5	21.5	34.5	32.5	35	30	40	32
pH	7.5	7.8	7.1	6.8	8.2	7.6	6.8	7.8
DO (mg/l)	1.7	4.12	1.8	1.7	2.4	5	4.2	3.3
FCO_2(mg/l)	5.5	1.9	7.4	10	1.2	4.1	13.9	6.4
HCO_3^-(mg/l)	176.9	531.92	248.88	176.9	243.6	462.01	324.1	246.4
CO_3^{2-}(mg/l)	-	-	-	-	-	-	-	-
Cl^- (mg/l)	14.26	35.03	22.52	14.26	21.02	19.25	16.51	24.21
Ca^{2+} (mg/l)	17.63	30.46	19.004	17.63	41.2	31.06	24.02	19.06
Mg^{2+}(mg/l)	14.58	37.17	19.01	14.58	28.24	30.26	17.0	15.03

Table 3: Showing average values of various physicochemical parameters of lentic water bodies of R.S.Pura.

Parameters	Kotli	Agrachak	Badyal-Deharian	Fatehpur – Silarian	Mahesian	Gharana	Chowala	Baspur – Bangla
Colourof water	Brown	Blackish Brown	Greenish Brown	Brown	Brown	Brown	Greenish Brown	Brown
Air temp.(°C)	31	28	27.5	26	34	34	20	29.5
Water temp.(°C)	29	21.5	22.5	21.5	27	32	19	21
Transparency(cm)	25	67.5	33.5	25.5	45	15.3	16.5	27.5
pH	7.4	7.2	7.6	7.6	7.6	8.4	7.9	7.7
DO (mg/l)	3.9	5.72	4.0	6.06	3.5	2.4	4	4.0
FCO_2(mg/l)	2.8	8.2	3.6	1.0	6.4	1.2	5.5	6
HCO_3^-(mg/l)	242.06	497.76	296.46	247.66	317.2	463.6	282.5	247.66
CO_3^{2-}(mg/l)	-	-	-	-	-	-	-	-
Cl^- (mg/l)	13.24	25.027	9.51	14.51	10.011	23.95	34.6	29.53
Ca^{2+} (mg/l)	33.06	41.40	29.46	39.52	12.82	22.46	47.6	13.22
Mg^{2+}(mg/l)	34.24	36.64	31.06	40.301	26.73	22.84	324	22.72

Chloride

Chloride is considered as one of the most important inorganic anion in water. It occurs naturally in all types of water due to its high solubility.

The average chloride values ranged from 9.51mg/l to 54.6 mg/l. The increased concentration of chloride is considered as an indicator of eutrophication and pollution due to sewage (Chourasia and Adoni 1985). In present analysis chloride concentration was found within the acceptable limit of 20 mg/l set by ICMR for most of the water bodies except for few (table 1, 2 and 3) where values were above the limit. Higher chloride concentration may be due to more discharge of domestic sewage near the sampling sites (Murehkar, 2011).

Calcium and magnesium

Hardness is the property of water which prevents the lather formation with soap and increases the boiling point of water. Hardness of water mainly depends upon the amount of calcium or magnesium salts or both. During present analysis calcium concentration was found to be in the range of 8.01 mg/l to 82.42 mg/l and magnesium content ranged between 12.15mg/l to 48.62mg/l and found to be within permissible limit of WHO. Trivedi and Goel (1986) and Singh and Mahajen (1987) are of the view that the high hardness is suggestive of pollution due to domestic waste and industrial effluents The present results suggest water pollution is well below the desirable limit (BIS, 1991).

Conclusion

The overall survey gave some (but not all) unsatisfactory results, which were due to contamination through various means. Sewage, land and urban run-off and domestic waste waters normally discharged into water. Water tanks and taps in the houses were not well protected against contamination. Fecal contamination of surface waters and shallow wells was largely due to lack of proper sewage facilities. The water was found contaminated mostly by cross- links and open leaks of the distribution system. Cooperation between the government and public must be strengthened to attain the goal of sustainable development. The authorities should maintain a quality of water that is acceptable to the consumer and that is in line with the specifications and recommendations of WHO. Drinking water treatment plants must be installed for distribution of pure water. Above all, there is need to educate the general public about the importance of water quality and its impact on their health as well as on the environment where they live.

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