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Comparative Study of Physico - Chemical Characterization of Drinking Water in Domestic and Industrial Areas of Panipat

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Abstract: ***In the present research paper, an attempt has been made to study the comparison in Physico - Chemical parameters of drinking water in domestic and industrial areas of district Panipat. Fifteen different samples of drinking water were taken from different geographical locations in domestic and industrial areas of district Panipat, Haryana. pH, EC, TDS, and Salinity were measured in these samples using analytical laboratory techniques and instrumentation. pH in domestic area ranged from 7.12 to 7.40 which shows trend towards basic nature and in industrial areas, it ranged from 7.85 to 8.16. EC and TDS values were surprisingly far different in domestic and industrial areas. These values are lying in the range of standard values of water quality set by agencies like WHO, however at some sample locations these are on the margin of the standard limits. These marginal values suggest the need of some preventive mechanism from industrial effluents and their safe discarding method.***

Keywords: Water Quality, industrial pollution, Physico Chemical Analysis, Drinking water standards, Environmental monitoring

1. Introduction

Throughout the ages, water has been considered pure medium carrying nutritional elements for survival of every form of life on the earth. Water covers about 71 % of earth surface. From biological direction, water possesses lot of different characteristics that are critical for propagation of life. Certain Physiochemical parameters of drinking water has to be in a strict limits, which are governed by certain water standards regulatory authorities like WHO, USEPA, BIS, ICMR etc. These agencies strictly and regularly monitor the water standards and their parametric values. Table 1 below tabulate the range for water quality standards as set by WHO and BIS.

Table 1: Water Quality Standards (As per WHO and BIS manual 2012)

Sr. No	Physico - Chemical Parameter	Standard Value (As per WHO and BIS manual 2012)
1.	pH	6.5 - 8.5
2.	EC	0 - 2500 µS/Cm
3.	TDS	500 - 2000 mg/L
4.	Salinity	100 - 1000 mg/L

In the present study, domestic and industrial areas in district Panipat, Haryana were chosen. This district is hub for handloom and Power loom industry. The dye houses and various clothes industries are lying very near to domestic areas of Panipat. These industries are emanating effluents in the form of gaseous components and also effluents in the form of waste water that goes by seepage into the earth and hence is polluting inside water. **Bishnoi et. al. (2008)** carried out the physiochemical analysis of ground water at 41 ground locations of Panipat city and found that pH ranged from 6.6 to 7.5, EC ranged from 0.09 to 3.28 mS/cm and TDS varied from 700 - 2100 ppm. This study revealed that there was a positive correlation of EC with TDS. **Vaishali S. et. al. (2013),** investigated ground water quality parameters for about 60 water samples from Panipat like pH, odour, TDS, Alkalinity etc and found that few samples were having values for these parameter higher than that specified by BIS. **Yadav A. et. al. (2014)** studied the impact of sugar industry on quality of ground water in the areas in vicinities of Sugar Mill Panipat. Various parameters like BOD, pH, Alkalinity were above the limits set by Bureau of Indian Standards. Panipat City has a no. exceeding 2400 cloth dye industries in its vicinity, a coal based thermal power plant, a refinery for petroleum and many more small scale and medium scale Excluding some renowned industries either Govt run or privately managed donot pre treat the waste water before its safe disposal. So most of the waste water in untreated form goes directly to land directly or indirectly and hence contaminating the available ground water in Panipat. Lot of research has been done so far for this, but comparative study in industry and domestic area has not been reported so far. So in this research paper, an effort has been made to study the comparative difference between water quality parameters of domestic and few industrial areas of Panipat.

2. Materials and Methods

15 sample locations were chosen after extensive research of the areas which include 4 areas around I B College, Panipat, areas around 3 dye houses near sector 40, Panipat, One sample each from Sugar Mill area, NFL and Industrial area Panipat. SD college area, Sukhdev Nagar and Area around Arya School Panipat were also chosen for study. The samples were collected from the either private Pump or Tube well installed at sample locations. pH and EC were measured using Systonic S901 and S948 model respectively. The water quality parameter like pH, Electrical Conductivity, Total dissolved salt and salinity were measured with instrumentation available at Chemistry Laboratory, I. B. College, Panipat. SPSS 16.0 was used for statistical analysis of the data obtained. Table 2 below shows the nomenclature used for sampling locations.

Table 2: Sampling locations Nomenclature

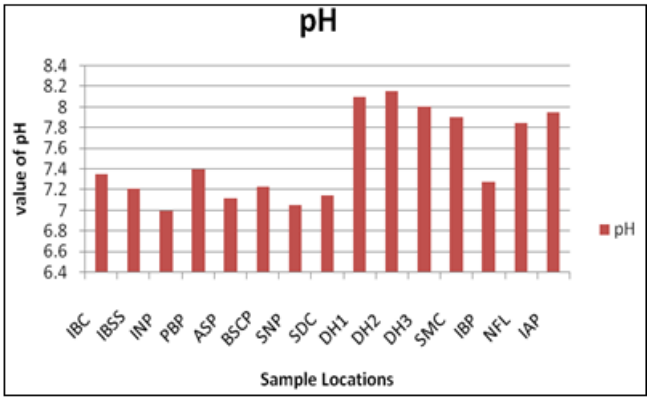
Sr. No.	Sample Location	Nomenclature of Sample
1.	I B College, Panipat	IBC
2.	I B School Sr Sec School, Panipat	IBSS
3.	Insaar Bazaar, Panipat	INP
4.	Pachranga Bazaar, Panipat	PBP
5.	Arya School, Panipat	ASP
6.	Bishen Swaroop Colony, Panipat	BSCP
7.	Sukhdev Nagar, Panipat	SNP
8.	S D College, Panipat	SDC
9.	Dye House 1, Sec 40, Panipat	DH1
10.	Dye House 2, Sec 40, Panipat	DH2
11.	Dye House 3, Sec 40, Panipat	DH3
12.	Sugar Mill Colony, Panipat	SMC
13.	I B Public School, Panipat	IBP
14.	NFL, Panipat	NFL
15.	Industrial Area, Panipat	IAP

3. Results and Discussions

The measured Physico - chemical parameters like pH, EC, TDS and Salinity for different location in domestic and industrial areas of Panipat are tabulated in Table no.3.

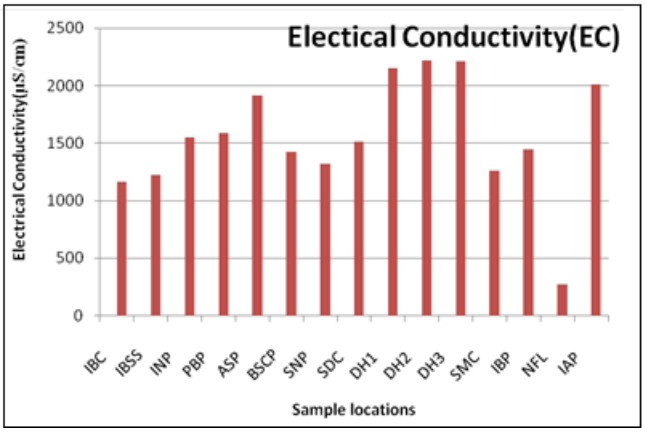
Sample Location	pH	EC (µS/cm)	TDS (mg/L)	Salinity (mg/L)
I B College, Panipat	7.35	1165	740	572
I B Sr. sec School, Panipat	7.21	1224	776	620
Insaar Bazaar, Panipat	7.00	1548	972	756
Pachranga Bazaar	7.40	1585	994	785
Arya School, Panipat	7.12	1915	1200	964
Bishn Swroop Colony, PNP	7.23	1426	889	699
Sukhdev nagar, Panipat	7.05	1320	824	662
S D college, Panipat	7.15	1516	976	752
Dye House 1 Sec40, Panipat	8.10	2150	1382	1087
Dye House 2 Sec40, Panipat	8.16	2218	1452	1091
Dye House 3 Sec40, Panipat	8.01	2210	1435	1093
Sugar Mill Colony, Panipat	7.90	1261	788	628
I B Public School, Panipat	7.28	1450	903	732
NFL, Panipat	7.85	277	175	139
Industrial Area, Panipat	7.95	2010	1291	989

The value of pH for domestic areas varied from 7.12 to 7.40 and for industrial areas it varied from 7.85 to 8.16. These values are indicating basic character of water, whereas as per WHO water quality standards, it should lie within 6.5 to 8.5. So measured pH values are within the range specified by WHO for safe drinking water. Values of measured pH for different sampling locations are indicating in graph no.1, which depicts minimum value of pH as 7.00 for Insaar Bazaar, Panipat and maximum value as 8.16 for Dye house 2, Sec 40, Panipat.



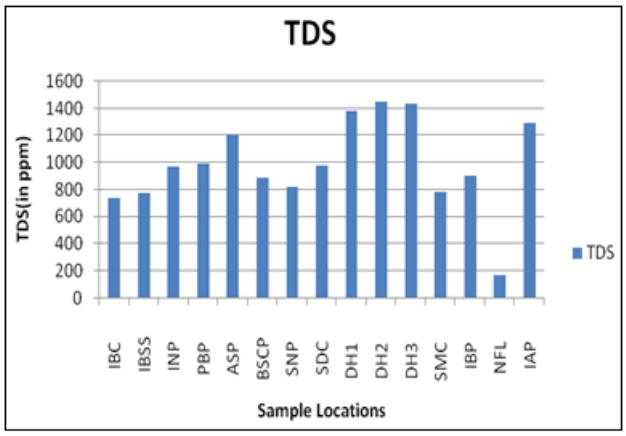
Graph 1: pH values of water samples at different locations

Electrical conductivity (EC) has values ranging from 277 µS/cm to 2218 µS/cm which are very well within the range specified by BIS and WHO. The minimum value for EC is for NFL, Panipat and maximum value is for Dye house 2, Sec 40, Panipat. The standard water quality range specified for safe drinking is 0 - 2500 µS/cm mentioned by Bureau of Indian Standards (BIS) and World Health Organisation, (WHO). Graph 2 depicts the variation of EC with sample locations.



Graph 2: Values of EC at different Sample Locations

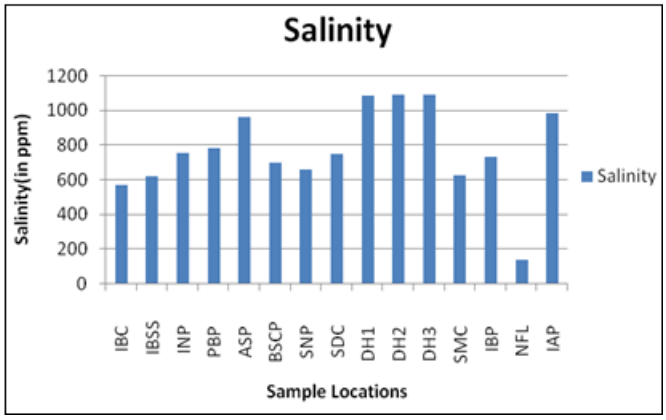
TDS values measured at the sample locations are in the range of 175mg/L – 1452 mg/L, where the minimum value is of water sample of NFL, Panipat and maximum TDS observed is at Dye house 2, Sec 40, Panipat. Graph 3 represents the variation of TDS at different sampling locations.



Graph 3: Values of TDS at different Sample Locations

Salinity measyrement also reveled the surprising results. The minimum value was again at NFL, panipat and was 139 mg/L and maximum value was 1093 mg/L at Dye house 3, Sec 40, Panipat.

Graphical variation of salinity w. r. t. sample locations is shown in graph 4.



Graph 4: Variation of salinity with location

4. Conclusions

In the present study, we have examined the comparative difference between physico - chemical parameters of drinking water in domestic and industrial areas of Panipat. The values of pH, TDS, EC and salinity differs significantly in domestic and industrial areas, which suggests a strong dumping mechanism of waste water from industries situated in vicinity of domestic areas particularly.

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