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Effect of Textile Industrial Effluents on Water Quality of Bandi River (Pali) Rajasthan, India

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Abstract: In the present study the effects of Textile industrial effluent on Bandi river water was investigated at Pali district of Rajasthan. The present reveals that the many physico-chemical parameters of river water are more than the standard levels and they were found to be higher in concentration. Textile industries of Pali city discharge plenty of pollutants that get mixed up with water bodies of Bandi River. The soil sites near to river became polluted due to mixing of industrial effluents coming from textile industries located nearby Bandi River. Thus the analysis of water became an apparent need for best agriculture practices. Results of current study analysis revealed significant variance in the values of the parameters like pH, BOD, COD, TDS, TSS, Hardness, Cl^- and SO_4^{-2} from the range of standard values. On the basis of these observation it can concluded that the textile industrial effluents are adversely affecting the water quality of river and concentration of effluents affects the soil quality. It also affects aquatic environment, characteristics of ground water, agriculture land and human beings of surroundings.
Keywords: textile effluents, Bandi River, physico-chemical parameter, BOD, COD

I. INTRODUCTION

British poet W. H. Auden says “Thousands have lived without love, not one without water.” All living being on Earth needs water to survive. Water is an essential component of all living organisms on the earth. Any chemical or biological variation from normal composition leads to water pollution. Water of good quality is required for a living organism.

Water quality of gulab sagar pond, Jodhpur is changed due to anthropogenic activity(S.Makwana ,2020) Recently more than 800 industrial units are carrying out dyeing and printing of cotton and synthetic clothes on large scale **(Rathore, 2012)**. Many studies were carried out in order to assess the impact of textile dyeing effluents on the surface water quality. (Rathore, 2011).

Shellina Khan, Navneet Joshi (2019) reported that Textile industries of Jodhpur and Balotra cities of Western Rajasthan discharge plenty of pollutants that get mixed up with water bodies. Hence, it can be conclude that the concentration of effluents affects the soil quality.

L. R. Meena at.al., (2017) concluded that the textile industrial effluents was adversely affecting on the river water quality, which affects on aquatic environment and human beings of surroundings.

According to Sarkar R *et al.,* (2020) reported that analysis of physicochemical parameters is very essential and important to test the water before it is used for domestic, agricultural, industrial or any other purposes. So, it is necessary that the quality of domestic and drinking water should be checked.

Water pollution is a major problem produced by industrial effluent in Pali, Rajasthan. The printing and dyeing industries cover a major portion of the industrial section in Pali. The textile effluent discharged through these industries is of toxic nature that was also noticed by Satish, *et.,al*, (2008). Improperly treated wastewater from textile and dyeing industries of Pali affecting groundwater quality and its surrounding areas due to discharge of improperly treated effluent from CETPs. Common Effluent Treatment Plant (CETP) has been set up by Pali Water Pollution Control Treatment and Research Foundation (PWPCTRF) on Mandia Road to minimize the problem of water pollution caused primarily by textile units in Pali, which operates on Biological treatment (N. Sharma et. al.,2013).

II. MATERIAL AND METHODS

A. Site Description

Pali city is known for its textile dyeing and printing work. The textile dyeing and printing units situated at Pali have been discharging effluents in the river Bandi. Water quality of Bandi River is severely polluted due to textile effluents (Rathore 2011).The current studies, therefore, have been taken up to assess the chemical characteristics of the industrial wastewater effluents in the surrounding area of Pali, and the extent of pollution load in the wastewater discharged in the river Bandi.Pali is the industrial dying and printing hub of Rajasthan state. At present about 800 textile industries are working.

B. Sampling Sites and Sample Collection

Monthly Water sample were collected from two different sampling sites of Pali industrial area for 18 months. The collected samples were detected for various water quality parameters viz. Water Temperature analyzed by simple thermometer pH, TSS (Total suspended solids), TDS (Total dissolved solids), TS (Total Solids), hardness, Biological Oxygen Demand (BOD), and Chemical Oxygen Demand (COD). For analysis of the water samples, standard methods of Trivedi and Goyal, (1986) and APHA, (1995) were followed for the analysis. The temperature, pH analysis and fixation of dissolved oxygen were done at the site.

III.RESULTS AND DISCUSSION

Table No. 1 Influent sample of CETP (Common Effluent Treatment Plant)

Months	Temp. °C	pH	BOD (mg/l)	Hardness (mg/l)	COD (mg/l)	TDS (mg/l)	TSS (mg/l)	Sulphate (mg/l)	Chloride (mg/l)
July 17	33.5	8.4	199	820	1024	6180	158	467	2530
Aug 17	35.8	8.5	190	910	1077	6250	824	570	2350
Sep17	36.2	8.8	131	1120	711	5140	137	820	1900
Oct 17	31.3	8.9	146	1110	766	6230	380	359	2216
Nov 17	29.5	7.7	170	990	870	6010	344	422	1740
Dec 17	26.2	8.3	175	1050	1224	7015	484	203	1700
Jan 18	27.5	9.1	230	1280	1325	7030	980	526	1350
Feb 18	29.7	9.2	295	1220	1459	5620	1348	364	1562
Mar 18	36.8	10.6	290	1350	2636	5140	1044	658	4258
Apl 18	40.1	8.2	280	1080	1692	6020	188	570	3740
May 18	43.5	8.9	386	950	2120	4150	201	1064	2360
June 18	43.8	7.8	429	880	2530	6380	830	1264	2320
July 18	32.8	7.8	341	940	2063	7350	546	917	2710
Aug 18	35.2	7.7	312	890	1788	6670	412	1047	2230
Sep 18	36.8	8.6	408	1280	1786	6520	458	1245	2250
Oct 18	31.5	9	312	1070	1474	5240	264	1143	2350
Nov 18	29.8	8.8	328	890	1364	5970	212	1056	2340
Dec 18	26.8	8.9	390	1130	1597	6210	593	926	2490
Maximum value	43.8	10.6	429	1350	2636	7350	1348	1264	4258
Minimum value	26.2	7.7	131	820	711	4150	137	203	1350
Mean value	33.8	8.67	278.44	1056.5	1528.11	6031.25	522.38	754.4	2400.2

Table No. 2 Effluent sample of CETP

Months	Temp. ^{o}C	pH	BOD (mg/l)	Hardness (mg/l)	COD (mg/l)	TDS (mg/l)	TSS (mg/l)	Sulphate (mg/l)	Chloride (mg/l)
July 17	32.6	8.3	26	710	198	6235	30	511	3080
Aug 17	35	8.8	26	790	150	7010	36	433	2510
Sep17	35.3	8.2	25	1050	126	6015	32	628	2300
Oct 17	30.8	8.7	38	920	195	6535	33	465	2320
Nov 17	28.9	8.1	28	770	182	6800	84	570	1270
Dec 17	25.7	8	23	932	192	7980	40	524	1023
Jan 18	27.1	7.5	38	1055	235	8010	15	1066	2760
Feb 18	28.3	7.9	27	1070	193	5940	44	490	1193
Mar 18	35.8	7.9	51	1160	273	5800	38	648	2072
Apl 18	39.2	7.7	68	1010	320	6995	32	941	3520
May 18	42.2	7.9	93	835	466	6030	56	1053	3020
June 18	41	7.5	126	760	751	7750	590	1232	3230
July 18	32.4	7.7	107	720	706	7840	217	1168	3240
Aug 18	34.8	7.5	64	780	329	7005	46	1152	2590
Sep 18	35.4	7.9	320	1040	1446	6880	258	1045	2710
Oct 18	30.5	7.5	126	915	714	6120	138	1240	2780
Nov 18	28.5	7.4	156	785	616	6456	84	982	2750
Dec 18	25.4	7.5	212	930	837	7230	68	847	3190
Maximum value	42.2	8.8	320	1160	1446	8010	590	1240	3520
Minimum value	25.4	7.4	23	710	126	5800	15	433	1023
Mean value	32.8	7.91	98.63	905.1	440.5	6822.05	102.27	854.47	2505.05

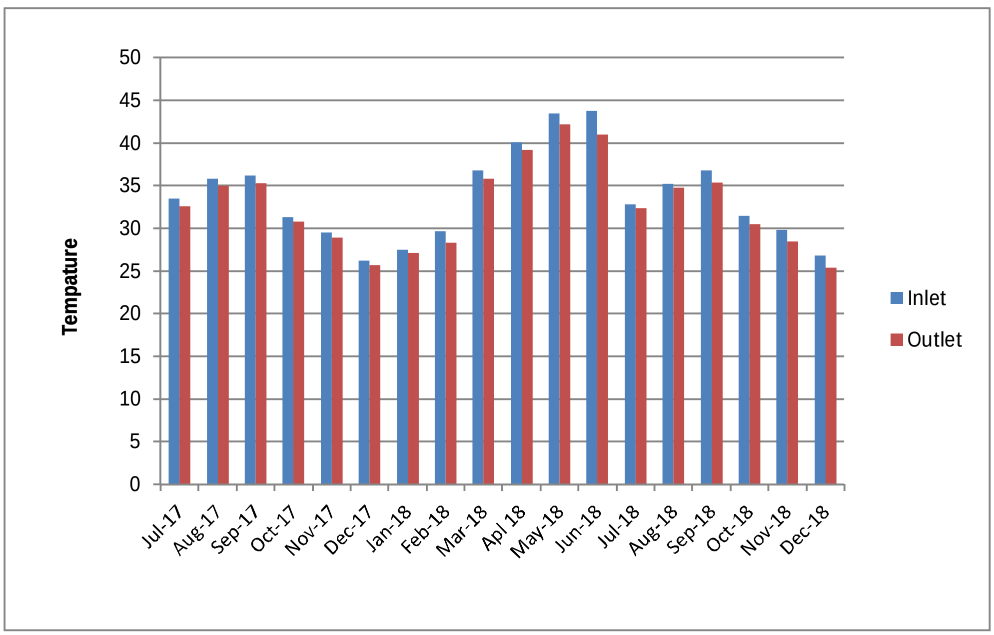

Fig.1 fluctuation in temperature

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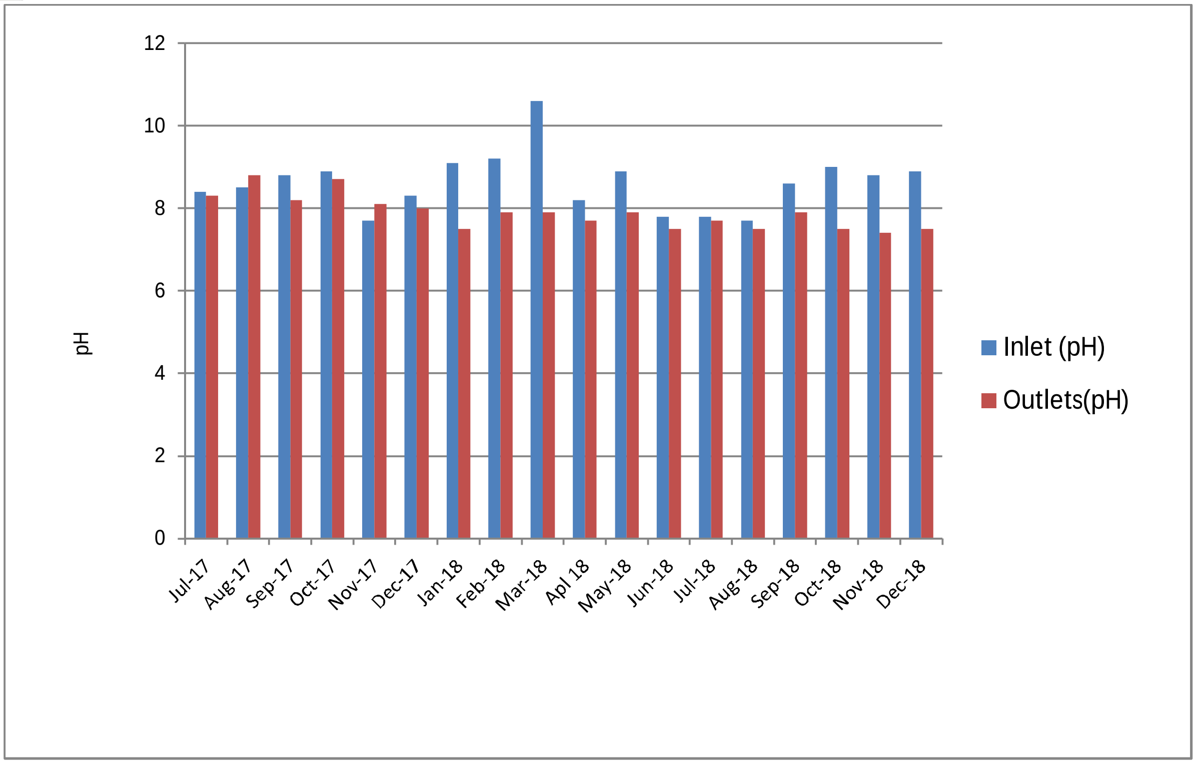

Fig.2 fluctuation in Ph

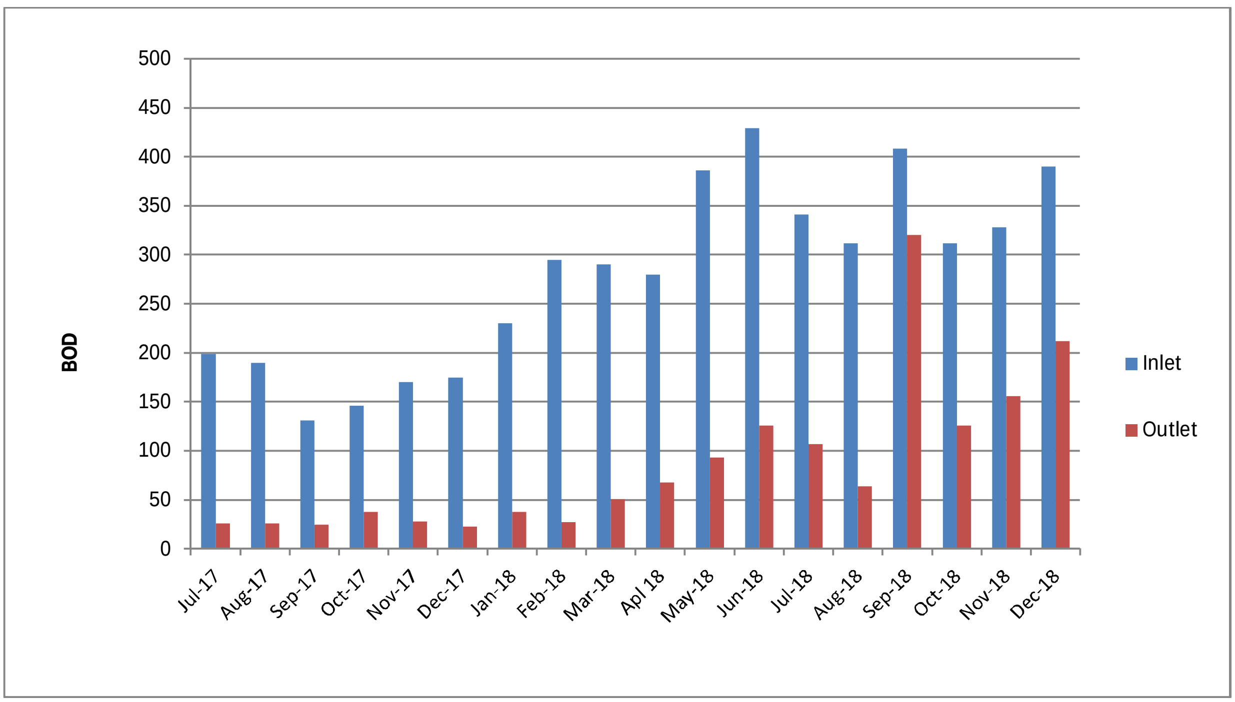

Fig.3 fluctuation in BOD

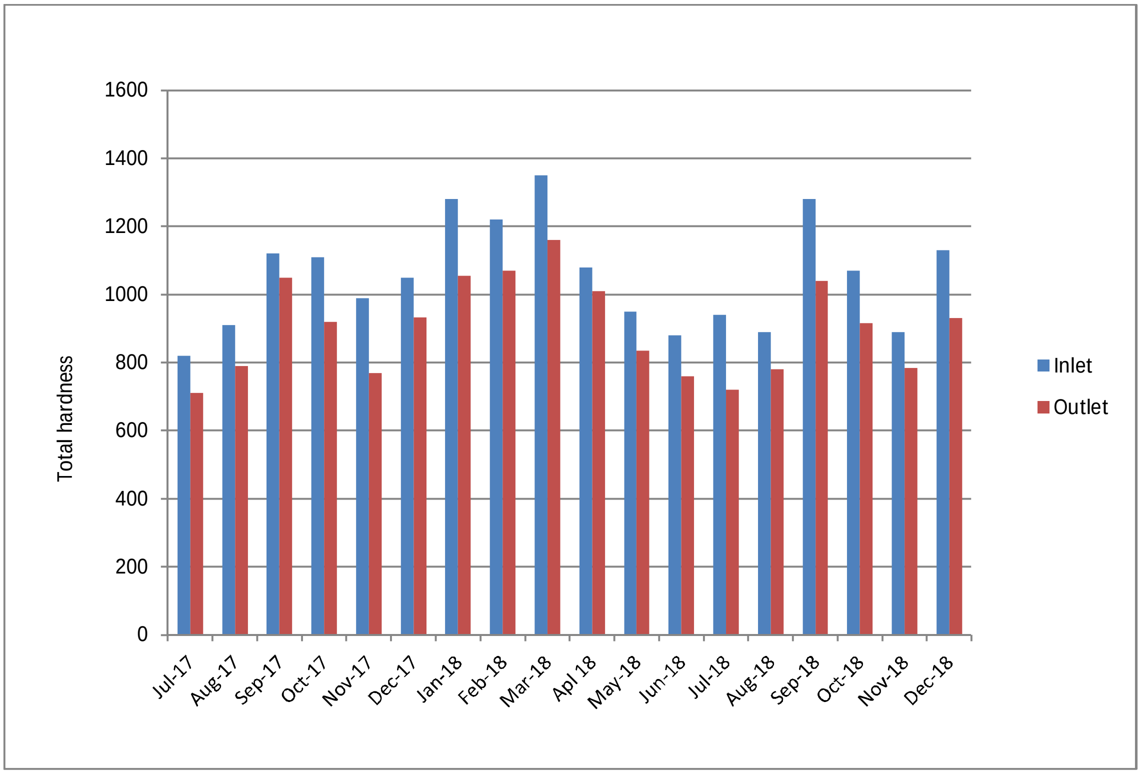

Fig.4 fluctuation in Total hardness

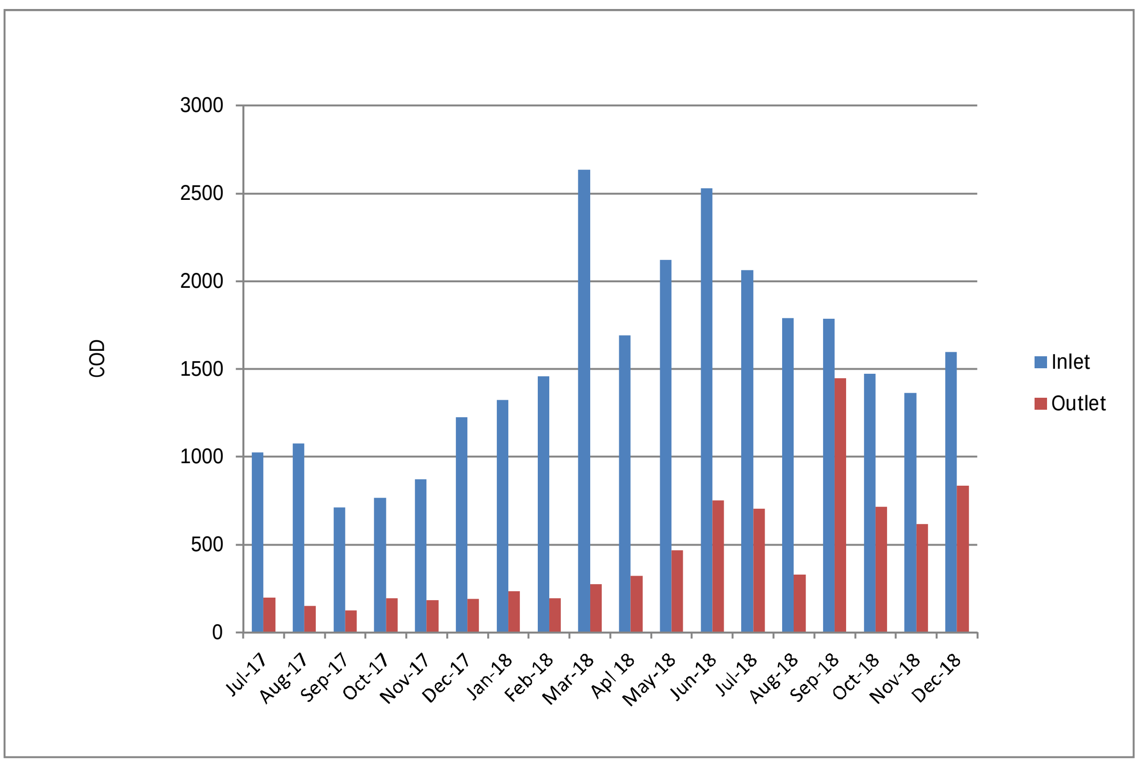

Fig.5 fluctuation in COD

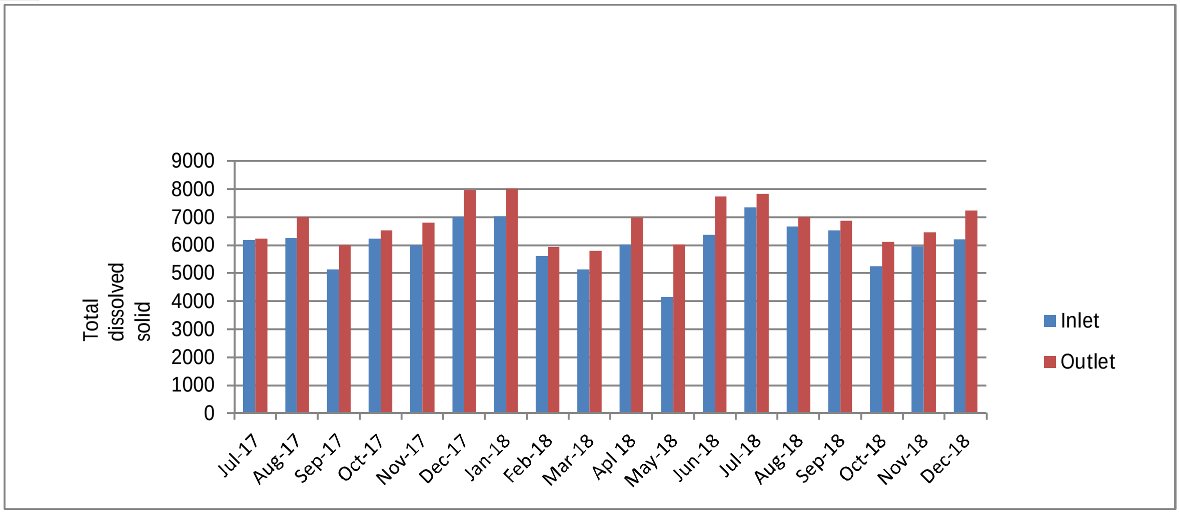

Fig.6 fluctuation in TDS

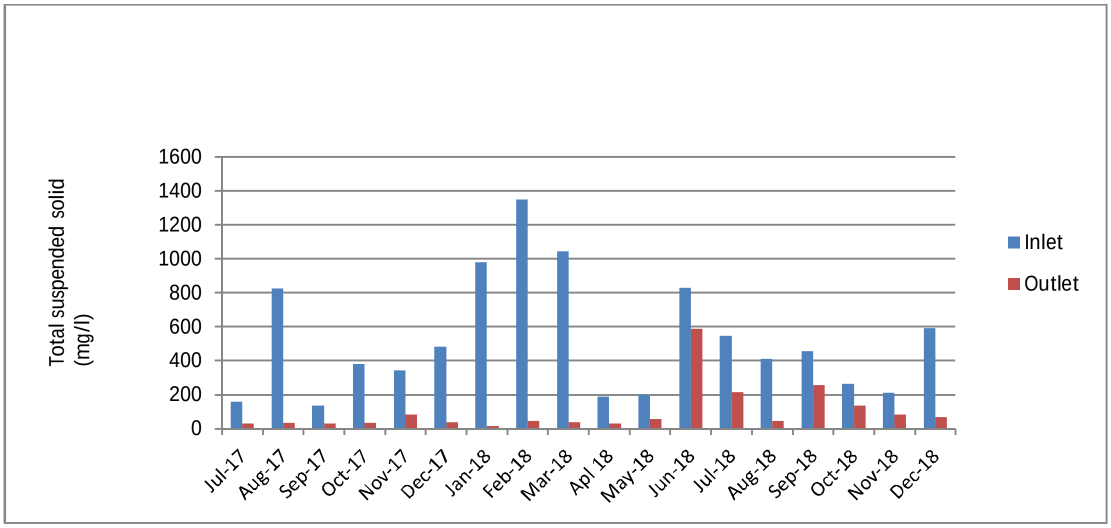

Fig.8 fluctuation in TSS

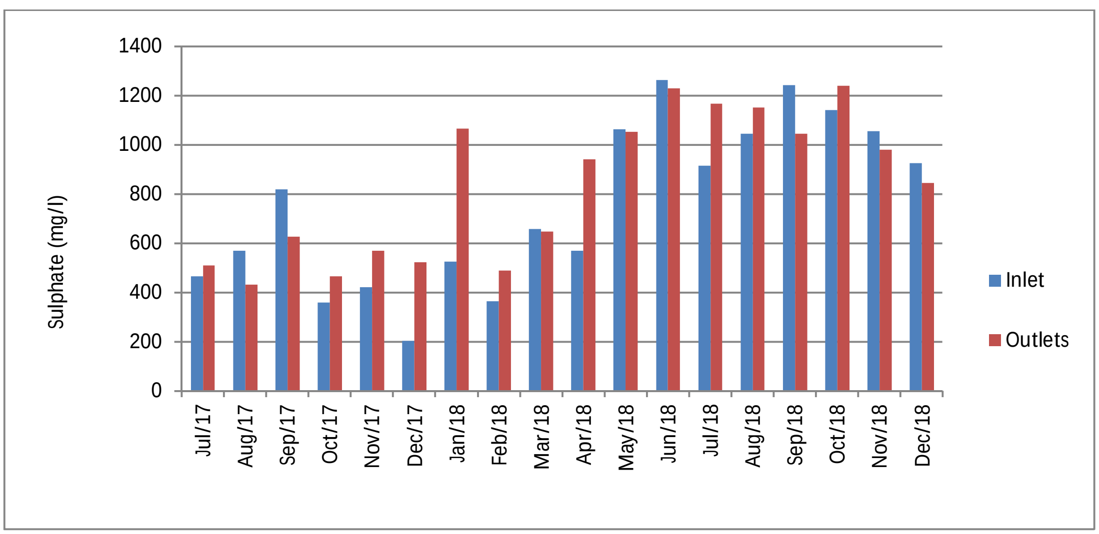

Fig.8 fluctuation in Sulphate concentration

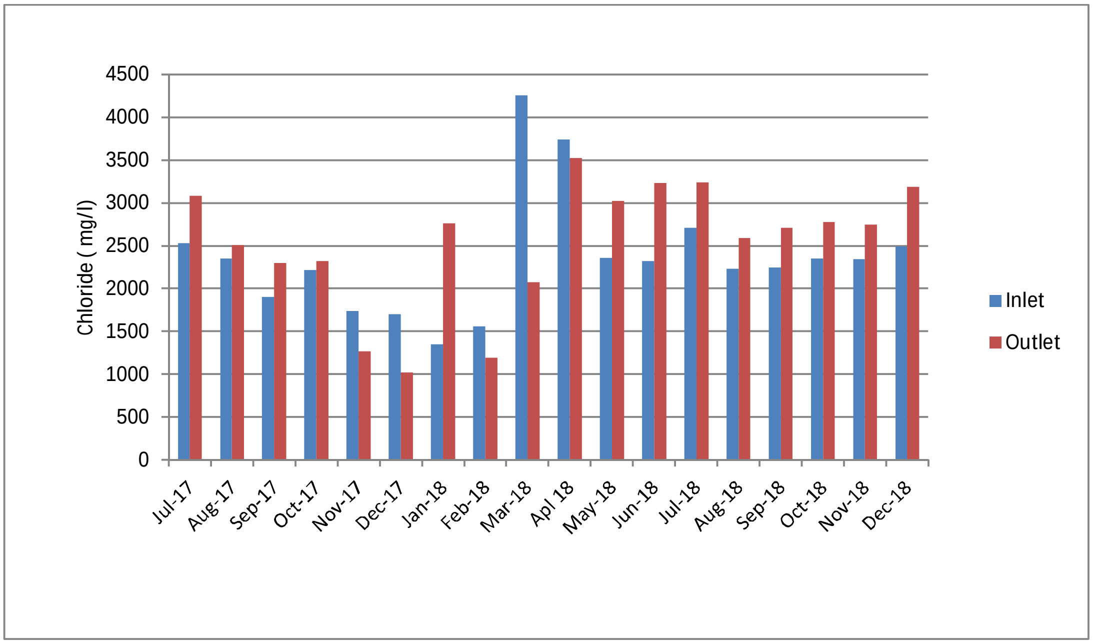

Fig.9 fluctuation in Chloride concentration

In sampling station, the maximum temperature of influent sample (43.8^{0}C) was observed in the month of June 2018 and effluent sample (42.2^{0}C) was observed in the month of May 2018 and the minimum temperature of influent sample (26.2^{0}C)was found in month of December 2017 and effluent sample (25.4^{0}C) was observed in the month of December 2018 (Table 1,Fig.1).

The maximum pH of influent sample (10.6) was observed in the month of March 2018 and effluent sample (8.8) was observed in the month of august 2017 and the minimum pH of influent sample (7.7)was found in month of august 2018 and effluent sample (7.4) was observed in the month of November 2018 (Table 2,Fig.2).

The maximum BOD of influent sample (429 mg/l) was observed in the month of June 2018 and effluent sample (320 mg/l) was observed in the month of September 2018 and the minimum BOD of influent sample (131 mg/l) was found in month of September 2017 and effluent sample (23mg/l) was observed in the month of December 2017 (Table 3, Fig.3).

The maximum Total Hardness of influent sample (1350 mg/l) was observed in the month of March 2018 and effluent sample (1160 mg/l) was observed in the month of March 2018 and the minimum Hardness of influent sample (820 mg/l) was found in month of July 2017 and effluent sample (710 mg/l) was observed in the month of July 2017 (Table 4, Fig.4).

The maximum COD of influent sample (2636 mg/l) was observed in the month of March 2018 and effluent sample (1446 mg/l) was observed in the month of September 2018 and the minimum COD of influent sample (711 mg/l) was found in month of September 2017 and effluent sample (126 mg/l) was observed in the month of September 2017 (Table 5, Fig.5).

The maximum Total dissolved solid of influent sample (7350 mg/l) was observed in the month of July 2018 and effluent sample (8010 mg/l) was observed in the month of January 2018 and the minimum Total dissolved solid of influent sample (4150 mg/l) was found in month of May 2018 and effluent sample (5800 mg/l) was observed in the month of March 2018 (Table 6, Fig.6).

The maximum Total suspended solid of influent sample (1348 mg/l) was observed in the month of February 2018 and effluent sample (590 mg/l) was observed in the month of June 2018 and the minimum Total suspended solid of influent sample (137 mg/l) was found in month of September 2017 and effluent sample (15 mg/l) was observed in the month of January 2017 (Table 7, Fig.7).

The maximum Sulphate ion concentration of influent sample (1264 mg/l) was reported in the month of June 2018 and effluent sample (1240 mg/l) was observed in the month of October 2018 and the minimum Sulphate ion concentration of influent sample (203 mg/l) was found in month of December 2017 and effluent sample (433 mg/l) was observed in the month of August 2017 (Table 8, Fig.8).

The maximum chloride ion concentration of influent sample (4258 mg/l) was reported in the month of March 2018 and effluent sample (3520 mg/l) was observed in the month of April 2018 and the minimum chloride ion concentration of influent sample (1350 mg/l) was found in month of January 2018 and effluent sample (1023mg/l) was observed in the month of December 2017 (Table 9, Fig.9).

IV. CONCLUSIONS

The huge quantities of wastes and sludge discharged from industries might be responsible for the enrichment of all studied physico-chemical parameters at discharging point by Tabassum *et al.,* (2015). Due to increasing the heavy load of such nutrient in water body their biological oxygen demand also more said by Dabhade and Tandale (2016).Rathore (2012) studied the wastewater from industries had a deleterious impact on the water quality of Bandi river.

This study has shown that textile mills discharges effluent with high degree of alkalinity, metal ion concentrations, high cod and BOD values which are not in compliance with standards. Huge amount of water and chemicals are used in different processes which are discharged as waste water that are high in COD, BOD, TDS and toxic chemicals.Textile effluent is the most significant parameter for water pollution in Bandi River, Pali. It is observed by the study that the pH of river water is more than the permissible limit while most of the parameter like BOD, total hardness are found much higher concentration. TDS,chloride and sulphate concentration are more in outlet sample than inlet sample. Hence we predicted that bandi river water is unsafe for drinking. This study concluded that textile effluents are highly toxic in nature and effects on these river water parameters. In spite of the installation of CETP, the Bandi river still has enormous soil pollution adversely affecting the soil fertility.

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