

# IMPACT OF SUGAR INDUSTRY ON WATER QUALITY IN EASTERN MARATHWADA

H. B. NAGRE<sup>1</sup>, A. M. ZINE<sup>2</sup>, S. D. MANE<sup>3</sup>.

<sup>1</sup>Department of Chemistry, Vivekanand college, Aurangabad.

<sup>2</sup>Department of Chemistry, Sunderrao Solanke mahavidyalaya, Majalgaon, Dist.- Beed.

<sup>3</sup>Ex.Joint Director,co-operative societies, Aurangabad.

**Abstract :** India is the largest sugar producing country in the world. After Textile industry, Sugar industry is the second largest industry in the nation. Maharashtra is one of the important sugar producing states in India. Konkan, Vidarbha, Marathwada are some of the regions of Maharashtra. In Marathwada alone there are more than thirty sugar factories. Sugar industries largely affect the human life in number of ways. Its disturbance to ecosystem by Air pollution, Soil pollution, Water pollution is some of them. Four sugar factories were selected from eastern marathwada for the study. One was Shankar co-operative sugar factory, situated at Kusumnagar, Bhokar dist Nanded. Second was Godawari manar sugar factory situated at Shankar nagar district Nanded. Third was the Purna Sugar Factory, Wasmalnagar, district Hingoli. And the last was Godavari –Dudhana Sugar Factory, Pathari district Parbhani. Three sampling stations were selected from each factory area. The sampling and testing of sample were carried out for one year (January 2016 to December 2016). All twelve samples were tested for various Physico-Chemical parameters like temperature, colour, pH, ORP, conductivity, TDS, COD, BOD, DO, Hardness, Calcium, magnesium, chloride and sulphate

**Key words:** Sugar factories, Sewage, Pollution.

## INTRODUCTION:

Water is unique and ubiquitous on earth. It is important for life and dissolves number of substances into it. When various constituent get dissolved in water more than its natural limit then such water is considered as polluted water and the process as Water pollution.

Numbers of sources are responsible for water pollution for example Natural source, urban source, agricultural source, industrial source extra.

In today's life, industry contributes maximum for water pollution. The major industrial pollutants are variety of chemicals. Many times these may be waste chemicals or byproducts or waste products such as pulp and paper mills, coal washeries, petroleum refineries, chemical fertilizer plants, dyes and colour industries, textile industries, distillaries, leather industry, sugar factories and many more.

In most of cases, waste and byproducts are emptied directly into natural water bodies or buried in ground. These underground buries finally find their way into water. In this way water gets polluted.

In present study, contribution of sugar factories for water pollution from eastern Maharashtra was considered.

## MATERIALS AND METHODS :

### Experimental:

The physico chemical analysis of collected samples is presented in Tables 1,2,3, and 4. All domestic, industrial and agricultural effluents affect in some way the normal life. When water is unacceptable for its normal usage, then it is said to be polluted.

Polluted water is responsible for a very large number of mortalities and in capacitance in the world. It leads to steady decline in fisheries and also affect irrigated land. The samples were checked for various parameters. All chemicals and reagents used were of AR grade.

## RESULTS AND DISCUSSION :

Maximum values of temperature during present investigation were recorded in summer and minimum in winter. The findings are in good agreement with those of Palhria<sup>9</sup>, Verma<sup>10</sup> and Ganpati<sup>11</sup>. The conductivity of water depends upon the concentration of ions. In present study there is seasonal variation in the values. Similar trend was also observed by Mittal<sup>19</sup>, Imevborne<sup>20</sup> and Adebisi<sup>21</sup>. Water having conductivity more than 20 uhos/cm. is not suitable for irrigation.

In case of Total dissolved solids, maximum values were recorded in summer. TDS values of selected samples are found much higher. Maximum value was recorded at kusumnagar, Nanded. General trend was in agreement with Gonsalves<sup>21</sup> and Joshi<sup>22</sup>.

Dissolved Oxygen (DO) content was much higher than 3 ppm which is the prohibited ISI standard<sup>25</sup>. Maximum D.O. values were observed at winter. This was in agreement with Trivedi<sup>29</sup> and Saxena<sup>30</sup>.

Biological oxygen demand (BOD) is indicative degree of pollution due to dilution low values during monsoon. Similar observations were recorded by Shaw. BOD values more than 8 are considered polluted water.

Chemical oxygen demand (COD) values give clear indication of organic pollution. These values show seasonal variation.

The pH values of water were changed drastically with time due to exposure to air; biological activity etc. The significant change in pH was due to disposal of industrial wastes.

Oxidation-Reduction Potential (ORP) values show that there is continuous load of organic pollution, which is in agreement with Gautam<sup>13</sup>.

Admissible chloride level is up to 250 ppm. Higher chlorides are indications of presence of organic matter which is also given by Thresh.

Recommended upper limit for sulphate ions is 250 ppm, and sample values are found within limit.

Total hardness is important parameter of gravity of

water. Hardness values exceeding 200 ppm may cause scale deposition in pipe lines and is more corrosive.

Calcium values are showing the trend winter > summer > rainy. Samples with more than 25 ppm values are called calcium rich.

The recommended value for magnesium is 125 ppm. These values are well in limit. Similar findings are also recorded by Allanson and Zafar.

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TABLE-1  
Physico-chemical Analysis of Ground Water  
SHANKAR Sugar factory, Kusumnagar, Bhokar, Dist. Nanded.

Site No.	Season	Temp.	Colour	pH	ORP mv	Conductivity	TDS (ppm)	COD (ppm)	BOD (ppm)	D.O. (ppm)	Hardness (ppm)	Calcium (ppm)	Magnesium (ppm)	Chloride (ppm)	Sulphate (ppm)
1	Winter	25.2	Colorless	6.85	198	86	98.38	108.7	8.28	8.4	480	82.00	68.61	82.73	131.45
	Summer	30.1	Colorless	5.25	202	97	163.50	157.6	9.31	8.3	625	78.82	66.09	89.24	145.90
	Rainy	29.3	Colorless	6.01	182	78	89.10	95.85	5.70	8.2	555	72.75	55.22	66.23	122.75
2	Winter	23.5	Colorless	10.7	235	90	108.38	130.6	6.50	8.1	460	77.90	65.63	79.67	145.97
	Summer	30.0	Colorless	9.25	265	169	164.35	140.3	9.45	8.0	535	76.75	67.11	88.94	165.86
	Rainy	29.0	Colorless	10.0	222	56	82.00	119.5	5.63	8.1	506	70.86	60.51	72.50	132.25
3	Winter	22.6	Colorless	6.25	175	112	105.38	136.3	6.25	8.3	513	90.85	77.00	91.52	117.68
	Summer	30.1	Colorless	5.85	185	198	175.65	139.7	6.60	8.0	555	84.94	63.46	97.62	142.60
	Rainy	29.1	Colorless	6.47	153	86	100.20	115.8	5.70	8.2	520	75.79	72.76	87.17	110.39

TABLE-2  
Physico-chemical Analysis of Ground Water  
GODAVARI-MANAR Sugar factory, Shankar Nagar, Nanded

Site No.	Season	Temp.	Colour	pH	ORP mv	Conductivity	TDS (ppm)	COD (ppm)	BOD (ppm)	D.O. (ppm)	Hardness (ppm)	Calcium (ppm)	Magnesium (ppm)	Chloride (ppm)	Sulphate (ppm)
4	Winter	25.5	Colorless	8.72	112	150	108.0	107.9	4.50	8.4	480.0	81.76	67.24	81.41	49.00
	Summer	30.0	Colorless	4.76	121	153	178.5	160.6	8.10	8.0	555.0	74.81	69.75	82.66	96.66
	Rainy	28.0	Colorless	5.80	90	140	97.40	160.4	4.06	8.1	530.0	70.16	104.76	78.10	45.00
5	Winter	24.6	Colorless	11.5	240	273	118.2	164.9	8.80	8.3	474.2	81.02	68.00	43.09	90.93
	Summer	29.5	Colorless	10.2	255	291	125.9	186.3	10.2	8.0	541.4	72.60	70.52	44.37	92.85
	Rainy	26.5	Colorless	11.0	212	260	103.1	118.1	8.30	7.8	492.0	76.11	99.81	42.48	30.00
6	Winter	23.6	Colorless	7.31	238	177	107.9	130.1	9.80	8.1	463.5	80.10	68.83	44.64	91.02
	Summer	30.5	Colorless	4.25	264	214	118.1	150.6	11.3	7.9	535.2	71.97	70.22	45.45	93.65
	Rainy	26.5	Colorless	5.53	148	146	86.00	120.5	9.10	7.9	505.3	76.09	98.70	33.55	35.00

TABLE-3  
**Physico-chemical Analysis of Ground Water**  
**PURNA Sugar factory, Wasmat Nagar, Dist.- Hingoli.**

Site No.	Season	Temp.	Colour	pH	ORP mv	Conductivity	TDS (ppm)	COD (ppm)	BOD (ppm)	D.O. (ppm)	Hardness (ppm)	Calcium (ppm)	Magnesium (ppm)	Chloride (ppm)	Sulphate (ppm)
7	Winter	26.5	Colourless	4.75	93	176	36.59	141.86	5.79	8.8	227.25	48.58	29.44	10.83	11.72
	Summer	30.5	Colourless	3.35	94	184	38.87	155.59	6.23	8.4	267.52	47.77	27.39	12.37	12.06
	Rainy	29.0	Colourless	4.66	87	160	31.80	140.25	5.06	8.7	238.50	45.80	30.80	10.42	10.26
8	Winter	22.5	Yellowish	6.25	88	231	31.82	124.28	5.84	7.4	216.30	48.92	27.85	15.38	19.90
	Summer	30.5	Yellowish	4.35	98	235	56.34	127.60	8.65	6.2	279.80	46.50	23.36	18.15	21.83
	Rainy	28.5	Yellowish	5.76	74	223	24.80	109.62	4.66	6.8	207.85	38.40	37.72	11.31	19.45
9	Winter	23.5	Brownish	9.65	159	94	80.35	142.50	6.01	8.6	215.27	92.62	18.28	17.72	18.10
	Summer	29.5	Brownish	8.35	199	96	83.71	154.99	6.84	8.0	281.75	75.75	19.74	18.34	19.73
	Rainy	27.8	Brownish	5.65	108	82	41.20	103.70	5.12	8.1	268.22	61.81	26.45	11.42	13.90

TABLE-4  
**Physico-chemical Analysis of Ground Water**  
**GODAVARI-DUDHANA Sugar factory, Pathri, dist. Parbhani.**

Site No.	Season	Temp.	Colour	pH	ORP mv	Conductivity	TDS (ppm)	COD (ppm)	BOD (ppm)	D.O. (ppm)	Hardness (ppm)	Calcium (ppm)	Magnesium (ppm)	Chloride (ppm)	Sulphate (ppm)
10	Winter	24.3	Colourless	6.91	119	228	50.06	240.0	8.40	10.1	304.43	70.80	44.83	19.28	23.77
	Summer	31.5	Colourless	3.92	130	232	51.25	243.2	8.80	9.8	380.94	70.00	48.13	20.92	25.94
	Rainy	28.5	Colourless	4.63	101	170	40.00	190.0	6.50	10.0	300.00	60.00	68.67	16.51	20.00
11	Winter	23.5	Colourless	7.92	101	86	62.06	140.1	9.07	9.8	89.63	38.88	18.32	14.10	26.63
	Summer	30.5	Colourless	5.55	111	92	64.88	183.8	9.73	9.5	96.00	30.80	19.33	14.80	28.10
	Rainy	28.5	Colourless	6.72	72	80	57.60	130.0	5.00	9.6	90.00	30.00	20.00	11.40	27.00
12	Winter	22.5	Colourless	7.64	139	98	32.60	99.2	8.96	8.2	191.16	41.96	32.71	16.60	59.40
	Summer	29.6	Colourless	5.65	170	120	39.72	143.5	9.00	8.0	201.70	34.65	27.06	24.01	83.45
	Rainy	28.5	Colourless	6.61	101	86	30.60	95.0	7.20	8.3	200.00	3.00	39.00	10.20	48.00