

# Physico-chemical Studies on Ground Water Quality of Mathura District (UP)

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## ABSTRACT :

Physico-chemical studies have been done on ground water of Mathura District (UP) from January to June 2011. Four water samples (2 from tube wells and 2 from hand pumps) were collected from different villages of Mathura district. The parameters pH, temperature, turbidity, DO, BOD, COD, Chlorides, Fluorides, Sulphates, Nitrates, Total Hardness and TDS were analysed and compared with WHO standards.

**Keywords :** Ground Water, Fluoride, DO, BOD, Total Hardness

## I. INTRODUCTION :

Water is most abundant, most essential but most abused natural resource. Ground water is main source of water supply for domestic purposes in the urban as well as in rural areas in UP. Ground water is commonly used for drinking purpose as it does not require any treatment. But due to urbanization, industrialization and growing population, ground water is becoming polluted. Ground water is colourless but contains different salts like, chlorides, sulphates, nitrates etc. Fluorides, toxic heavy metals have also been reported in some parts of India<sup>1-4</sup>.

Fluorosis is the one of the most crippling endemic disease affecting millions of people in different parts of world<sup>5</sup>. About more than 30 million people in 13 states of India are affected by Fluorosis<sup>6</sup>. Fluorine has certain physiological properties in relation to human health. It is present in animal tissues. It prevents dental caries if concentration is less than 1ppm. Higher concentration causes chronic fluoride toxicity or Fluorosis. Water containing above 1 mg/l causes

dental fluorosis and above 3 mg/l causes skeletal fluorosis if consumed for a period of 8-10 years<sup>7</sup>. Fluoride gets accumulated in hard tissues of the body and plays an important role in mineralization of bones and formation of dental enamel<sup>8</sup>. It is also known that excessive intake of fluoride is toxic to plants and causes clinical disturbance in animal and human beings. In general, water containing higher concentration of fluoride is associated with high alkalinity, low total hardness<sup>9</sup>, high pH<sup>10</sup> and high conductivity<sup>11</sup>.

## II. MATERIAL AND METHODS :

Two water samples from hand pumps (H1 and H2) and two from Tube wells (T1 and T2) of village Panigaon and Lohavan were collected in cleaned and dried polythene bottles. The samples were analysed for pH, temperature, turbidity, DO, BOD, COD, Chlorides, fluorides, sulphates, nitrates and total hardness in the month of January to June 2009-10.

Temperature was measured in °C by thermometer. pH was measured by digital pH meter (model 335) and turbidity by digital nepheloturbidity meter (model 132). DO, BOD and COD were determined in laboratory as per methods suggested by APHA (1985) and NEERI manual (1986). Chlorides and nitrates were estimated by titrating with AgNO<sub>3</sub>. Total hardness was determined by EDTA method. Sulphate was estimated by UV-VS spectro photometer (model 118). Fluoride concentration was determined spectrophotometrically using Alizarin red-5 and SPAND reagents.

Table 1. Physico-chemical parameters of Hand Pump water of village Panigaon and Lohavan (January to June 2011)

Parameters	Site	Jan	Feb	March	April	May	June
pH	H <sub>1</sub>	7.25	7.32	7.31	7.45	7.51	7.56
	H <sub>2</sub>	7.42	7.42	7.36	7.29	7.33	7.45
Temp. (°C)	H <sub>1</sub>	18.12	21.15	23.18	24.15	25.81	28.14

Turbidity (NTU)	H <sub>2</sub>	18.23	22.85	24.15	25.44	25.98	27.32
	H <sub>1</sub>	7.9	7.6	7.6	7.8	7.9	7.6
DO (mg/l)	H <sub>2</sub>	1.1	1.0	0.9	0.8	1.0	1.1
	H <sub>1</sub>	6.48	6.33	6.32	5.68	5.86	6.35
BOD(mg/l)	H <sub>2</sub>	6.11	6.57	5.68	5.94	5.87	6.11
	H <sub>1</sub>	11.2	11	10.8	11.5	11.3	10.8
COD(mg/l)	H <sub>2</sub>	8.2	9.0	10.8	10.5	10.3	10.1
	H <sub>1</sub>	85	76	81	78	72	84
Chloride(mg/l)	H <sub>2</sub>	80	76	74	70	72	79
	H <sub>1</sub>	450	460	480	470	470	480
Fluoride(mg/l)	H <sub>2</sub>	308	310	290	295	290	292
	H <sub>1</sub>	0.90	0.90	1.00	1.10	1.00	1.00
Sulphate(mg/l)	H <sub>2</sub>	0.80	0.70	0.80	0.90	0.70	1.00
	H <sub>1</sub>	280	295	275	270	295	295
Nitrates(mg/l)	H <sub>2</sub>	200	195	190	190	185	200
	H <sub>1</sub>	31	31	28	28	27	29
Total Hardnes(mg/l)	H <sub>2</sub>	26	26	27	28	27	26
	H <sub>1</sub>	285	300	310	310	320	305
TDS	H <sub>2</sub>	320	310	300	300	280	300
	H <sub>1</sub>	1580	1575	1570	1570	1565	1590
	H <sub>2</sub>	1190	1180	1185	1185	1190	1205

H<sub>1</sub> – Village Panigaon, H<sub>2</sub> – Village Lohavan

Table 2. Physico-chemical parameters of Tube well water of village Panigaon and Lohavan (January to June 2011)

Parameters	Site	Jan	Feb	March	April	May	June
pH	T <sub>1</sub>	7.42	7.59	7.45	7.54	7.26	7.38
	T <sub>2</sub>	7.32	7.44	7.45	7.50	7.41	7.26
Temp. (°C)	T <sub>1</sub>	17.13	20.36	21.33	24.75	27.27	28.14
	T <sub>2</sub>	17.15	21.43	22.12	25.15	28	28.14
Turbidity (NTU)	T <sub>1</sub>	0.6	0.6	0.7	0.6	0.8	0.8
	T <sub>2</sub>	0.9	0.9	0.8	1.1	1.0	0.8
DO (mg/l)	T <sub>1</sub>	5.91	5.87	6.1	6.0	5.57	5.59
	T <sub>2</sub>	6.17	6.11	5.9	5.98	5.55	5.45
BOD(mg/l)	T <sub>1</sub>	10.50	11.20	11.90	10.10	11.10	11.90
	T <sub>2</sub>	8.50	9.10	10.30	9.40	10.50	9.20
COD(mg/l)	T <sub>1</sub>	72	80	81	81	84	79
	T <sub>2</sub>	75	71	79	71	76	80
Chloride(mg/l)	T <sub>1</sub>	450	460	490	495	480	485
	T <sub>2</sub>	285	288	288	295	301	290
Fluoride(mg/l)	T <sub>1</sub>	1.10	1.00	1.00	0.90	0.80	0.80
	T <sub>2</sub>	1.00	0.70	0.70	0.90	0.90	0.80
Sulphate(mg/l)	T <sub>1</sub>	295	280	270	290	285	285
	T <sub>2</sub>	185	200	205	200	195	190
Nitrates(mg/l)	T <sub>1</sub>	31	30	27	27	27	29
	T <sub>2</sub>	25	25	29	27	27	29
Total Hardnes(mg/l)	T <sub>1</sub>	151	160	160	160	180	160
	T <sub>2</sub>	305	288	307	309	312	298
	T <sub>1</sub>	1530	1530	1560	1565	1550	1555

TDS	T <sub>2</sub>	1170	1195	1185	1185	1180	1190
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T<sub>1</sub> – Village Panigaon, T<sub>2</sub> – Village Lohavan

### III. RESULTS AND DISCUSSION :

Results found during the study have been given in table 1 and 2. The pH of samples collected from both villages were in the range of 7.25 to 7.56 (hand pump) and 7.26 to 7.59 (tube well), Temperature ranged 18.12 to 28.14 °C (HP) 17.13 to 28.14 °C (TW), turbidity ranged 0.8 to 7.9 NTU (HP) and 0.6 to 1.1 NTU (TW), DO ranged 5.68 to 6.57 mg/l (HP) and 5.45 to 6.17 mg/l (TW), BOD ranged 8.20 to 11.50 mg/l (HP) and 8.50 to 11.90 mg/l (TW), COD ranged 70.0 to 85.0 mg/l (HP) and 72.0 to 81.0 mg/l (TW), chloride ranged 290 to 480 mg/l (HP) and 285 to 495 mg/l (TW), fluoride ranged 0.70 to 1.10 mg/l (HP) and 0.70 to 1.00 mg/l (TW), sulphate ranged 185 to 295 mg/l (HP) and 190 to 295 mg/l (TW), Nitrates ranged 26 to 31 mg/l (HP) and 25 to 31 mg/l (TW), total hardness ranged 280 to 320 mg/l (HP) and 151 to 312 mg/l (TW) and TDS ranged 1180 to 1590 (HP) and 1170 to 1565 (TW).

### IV. CONCLUSION :

The permissible limit as per WHO (1995) standards for pH is 6.8 to 8.5, for sulphate 250 mg/l, for chloride 250 mg/l, total hardness 500 mg/l and fluoride 1-10.5 mg/l.

It is observed that all the parameters are almost within the range of WHO standards except chloride which is present in excess amount in tube well and hand pump water of both the villages. Fluoride concentration is almost same but at border line and within WHO limit of tube well as well as hand pump water of both the villages. Time to time monitoring is required but at present water can be used for domestic purpose.

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