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Study Of Seasonal Variation In Water Quality Parameters Of Various Ponds In Dist Dhar Madhya Pradesh India

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ABSTRACT
In this study, the physico-chemical characteristics of aquaculture water in many ponds in the district of Dhar, Madhya Pradesh, India, were evaluated in the winter and rainy seasons. Analysis was done on 19 different parameters, including conductivity, pH, turbidity, color, odor, sulfate, calcium, magnesium, alkanity, chlorine, fluoride, nitrate, iron, magnesium, residual chlorine, total coliform, and faecal coliform.
The findings demonstrated that the pond's inorganic hazardous chemicals are present in extremely small or negligible amounts. According to the current investigation, the mean values of pH, Total Coliform, and Faecal Coliform peak in the rainy (monsoon) period and fall in the winter. The mean values of turbidity, conductivity, TDS, Total Hardness, Ca, Mg, Sulfate, Alkanity, Cl, Fluoride, Nitrate, Iron, Magnise, and Residual Chlorine peak in the winter and fall in the rainy (monsoon) period.
Low water quality can likely provide health problems to humans. when pollutants in the water continue to cause the cultivated species' death. The quality of the water is important for manufacturing, farming, aquaculture, and intake.
Keywords: Physi-Chemical parameter, Rainy Period, Winter period, Ponds, Health risk

1. Introduction:

Water is a precious and limitless natural resource. Water is essential to the life of the plant and animal kingdoms. Therefore, "LIFE" is the name given to water. In our daily lives, it is essential for cooking, cleaning, drinking, and other activities. In addition, manufacturing, shipping, hydroelectric power production, and farming all require water.Although freshwater makes up less than 2.7% of all water on Earth, 67% of its surface is covered in it.The majority of freshwater, about 2.05%, is trapped in glaciers and ice caps. For human usage, less than 0.7% is accessible. One essential element for human survival is fresh water. The majority of freshwater bodies worldwide are becoming more contaminated, which makes water less portable.
The primary causes of water pollution in ponds, lakes, and rivers include solid waste discharges, sewage outlets, residential areas, detergents, automotive oil wastes, fishing establishments, and pesticides used on farms. Large-scale urban growth brought on by population growth or the migration of people from rural to urban areas has increased the amount of domestic effluents, whereas industrial development has resulted in the establishment of new industries or the expansion of existing ones, which has generated a large amount of industrial effluents.
Because there isn't a suitable drainage system in the Pithampur industrial region, the growing number of enterprises there could eventually cause a serious problem with contaminated drinking water and uses water. Due to a lack of drainage infrastructure, domestic waste from the industries' residential quarters was discharged into the surrounding environment. [1, 2, 3, 4, 5].

2. Material and Method:

2.1 Study Area and Sampling Sites

The study area was limited to the Dhar District in Madhya Pradesh, India. This region is known for its variety of water bodies, including ponds that are essential sources of water for the local population. A total of eight ponds were chosen for the sample process due to their accessibility and distinct usage patterns.

2.2 Sample Collection

Water samples were collected from each selected pond during both the rainy and winter seasons. Sampling was conducted at a depth of approximately 1 meter from the surface using a sterilized sampling bottle.

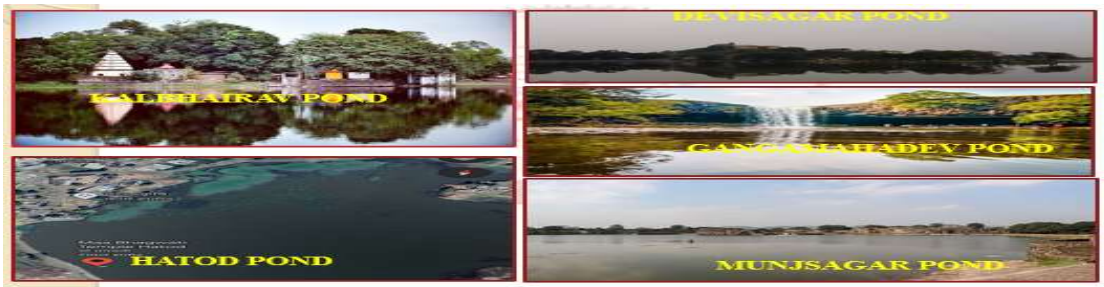


Figure No. 01 Water samples collection at the ponds

Many physiological factors depend on the temperature, pH, productivity, solubility of gases like Carbon dioxide; Dissolved oxygen etc. will be adversely affected [6,7,8]

2.3 Method:

The collected water samples were analyzed for the following physico-chemical parameters using standard analytical methods:

2.2.1 Color: Test done by as per ISO guideline/IP.

2.2.2 Odor: Test done by as per ISO guideline/IP.

2.2.3 **Turbidity:** Use turbidity tubes for tests of turbidity. Put sample water and distilled water into one tube. Turn on the turbidity meter from Nephlon. After adding the distilled water, set the value to one. Take out and place the sample of distilled water. Write the turbidity value down.

2.2.4 pH: Place a sample of water in a beaker. Take two more beakers, one with a pH of 7 and the other with a pH of 9. Turn the pH meter on. After cleaning with distilled water, submerge the electrode in a solution with a pH of 7. Use the conductivity meters to set the value to seven. After cleaning the electrode once more, dip it in pH 9. Use the slope to adjust to the 9. After cleaning the electrode, repeat the pH 7 and pH 9 tests. After cleaning, dip the electrode into the water sample. Lastly, record the pH value.

2.2.5 Conductivity: The ability of a solution, such water in a stream, to carry an electric current is measured by this. The amount of dissolved electrolyte ions in the water is indicated by this. The particular ions in the water are not identified by it. However, notable increases in conductivity could be a sign that water pollution has been introduced by polluted discharges. When different ions, such as sodium, phosphate, and nitrate, are present, the conductivity will increase. In a conductivity meter, samples were examined. In conductivity, micromhos per centimeter (μmhos/cm) or microsiemens per centimeter (μS/cm) are the fundamental units of measurement.

2.2.6 TDS: Test done by TDS kit.

2.2.7 Total Hardness: Total hardness is computed by sum of temporary hardness and permanent hardness. The sources of hardness of water is chiefly due to the dissolve of OH^- , HCO_3^- , Cl^- and SO_4^- ion of Ca^{2+}, Mg^{2+}, Fe^{2+} and Mn^{2+}. The usual signs of a hard water supply are scaling inside kettles, poor lathering of soaps and scum. Hard water is formed when water passes through or over limestone or chalk areas and calcium and magnesium ions dissolve into the water.

2.2.8 Ca: Test done by as per ISO guideline/IP.

2.2.9 Mg: Test done by as per ISO guideline/IP.

2.2.10 Sulfate: Test done by as per ISO guideline/IP.

2.2.11 Alkanity: In Take a burette and fill it with diluted H_2SO_4 for the alkalinity test. Put two drops of phenolphthalein into a conical flask containing a 20 ml water sample. Once the sample's color shifts from pale pink to colorless, titrate it and record the result as V1. Titrate the sample with two drops of methyl orange until the color turns from yellow to pink or red. Next, as V2, the burette's run-down volume was measured. The ability of water to neutralize acids is measured by its alkalinity.

2.2.12 Cl : Take a burette and fill it with $AgNO_3$ for the chlorides test. Using a measuring jar, transfer 20 milliliters of water into a sanitized conical flask. When one milliliter of K_2CrO_4 is added to the sample, the color turns yellow. Brick red is the result of the titrated sample solution filling the burette. Record the burette's volume run as V. The formula to calculate the chloride value is Chloride = (V X n X 35.46 X 1000) / Volume of Sample.

2.2.13 Fluoride Take a test tube and give it a thorough cleaning for the fluoride test. Now fill the test tube with five milliliters of water sample, add five drops of fluoride reagent 1, and give it a good shake. The generated final hue is contrasted with the provided chart. Note the fluoride content.

2.2.14 Nitrate: For the nitrate test, transfer 10 milliliters of water into the test tube, add a little amount of nitrogen reagent (NA-1), and thoroughly shake. Set it aside for ten minutes. After ten minutes, remove five milliliters of the solution, add three drops of nitrate reagent (NA-2), and give it a good shake. Leave it for two or three minutes. If the solution changes to a pink color after two to three minutes, we can conclude that there is nitrate in the water sample. Determine the nitrate value by comparing the acquired color to the reference chart.

2.2.18 Total Coliform: Test done by as per ISO guideline/IP.

2.2.19 Faecal Coliform: Test done by as per ISO guideline/IP.

2.2.20 BOD,COD and DO: Test done by as per ISO guideline/IP.

2.3 Data Analysis:

Statistical software, such as SPSS, was used to evaluate the data obtained and calculate the mean, standard deviation, and range of each physico-chemical parameter for the rainy and winter seasons. The significant variations in parameter values between the two seasons were evaluated using a paired t-test. The National Sanitation Foundation (NSF) approach was used to generate the Water Quality Index (WQI), taking into account the weights allocated to each parameter based on how important they are to the quality of the water.

3 Results and Disscuion:

This section presents the results of the physico-chemical analysis of water samples collected from eight different ponds in Dist Dhar, Madhya Pradesh, India. The data was collected during the rainy and winter periods, allowing for a comparative analysis of seasonal variations.

3.1 Seasonal variations :

3.1.1 Color: Test done by as per ISO guideline/IP.

3.1.2 Odor: Test done by as per ISO guideline/IP.

3.1.3 Turbidity: Water turbidity was maximum (72.7) during the rainy season at **Devi agar Pond** compared to other pond and minimum (2.5) during the winter season at **Gangmahadev**. Refer results in table no.01 and graph no.01.

3.1.4 pH: The pH values showed variations between the rainy and winter seasons, with some ponds exhibiting a higher pH (27.3) during the rainy period at **Devisagar pond and** higher pH (6.74) during the winter period at **Munjsagar pond.** Refer results in table no.01 and graph no.01.

3.1.5 Conductivity: Water turbidity was maximum (805) during the rainy season at **Gangmahadev Pond** compared to other pond and minimum (291) during the winter season at **Munjsagar pond** compared to other pond. Refer results in table no.01 and graph no.01.

3.1.6 TDS: The TDS values showed variations between the rainy and winter seasons, with some ponds exhibiting a higher TDS (472) during the winter period at **Himmatgard pond and lower** TDS (190) during the winter period at **Munjsagar pond.** Refer results in table no.01 and graph no.01.

3.1.7 Total Hardness: Total hardness levels generally remained relatively stable across both seasons. Refer results in table no.01 and graph no.01.

3.1.8 Ca: The values showed variations between the rainy and winter seasons, with some ponds exhibiting a higher value (72.8) during the rainy period at **Dilawara pond and lower** value (24.8) during the rainy period at **Kalbhairav pond.** Refer results in table no.01 and graph no.01.

3.1.9 Mg: The values showed variations between the rainy and winter seasons, with some ponds exhibiting a higher value (27.4) during the winter period at **Gangmahadev pond and lower** value (8.2) during the winter period at **Munjsagar pond.** Refer results in table no.01 and graph no.01.

3.1.10 Sulfate: Sulfate levels showed some fluctuations between the seasons, potentially influenced by agricultural runoff or other sources. Refer results in table no.01 and graph no.01.

3.1.11 Alkanity: Similar to sulfate, total alkalinity levels remained relatively constant across the rainy and winter periods. Refer results in table no.01 and graph no.01.

3.1.12 Cl : Chloride levels showed some fluctuations between the seasons, potentially influenced by agricultural runoff or other sources. Refer results in table no.01 and graph no.01.

3.1.13 Fluoride: Similar to Cl, total alkalinit levels remained relatively constant across the rainy and winter periods**.** Refer results in table no.01 and graph no.01.

3.1.14 Nitrate: The values showed between the rainy and winter seasons, with some ponds exhibiting a higher value (46) during the rainy period at **Himmatgard pond and lower** value (2.1) during the winter period at **Depalpur pond.** Refer results in table no.01 and graph no.01.

3.1.15 Total Coliform: Total coliform was maximum (620) during the rainy season at **Munjsagar Pond** compared to other pond and minimum (20) during the winter season at **Devisagar pond**. Refer results in table no.01 and graph no.01.

3.1.16 Faecal Coliform: Total coliform was maximum (220) during the rainy season at **Munjsagar** Pond compared to other pond and minimum (8) during the rainy season at **Himmatgard pond**. Refer results in table no.01 and graph no.01.

3.1.17 DO: DO Value was maximum (5.8) during the winter season at **Kalbhairav** Pond compared to other pond and minimum (2.6) during the rainy season at **Hatod pond.** Refer results in table no.01 and graph no.01.

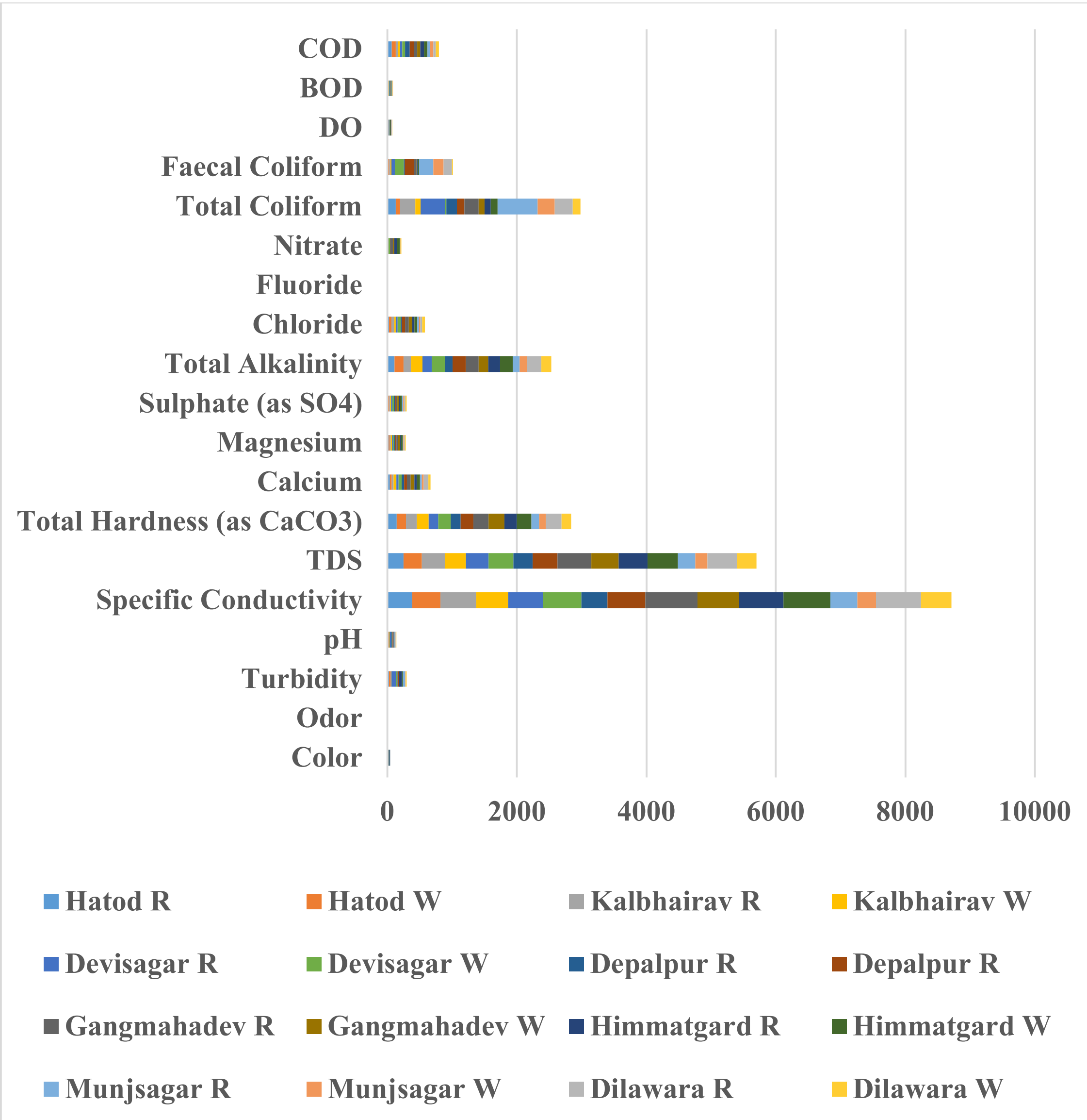
Table No. 01 Results of Water analysis of 08 pound during rainy and winter season

PARAMETERS	Hatod		Kalbhairav		Devisagar		Depalpur		Gangmahadev		Himmatgard		Munjsagar		Dilawara	
	R	W	R	W	R	W	R	W	R	W	R	W	R	W	R	W
Color	0				5	5	5	0	5	0	10	5	5	5	5	0
Odor	0				0	0	0	0	0	0	0	0	0	0	0	0
Turbidity	23.0	25.2	9.8	2.8	72.7	16.9	6.3	16.9	3.5	2.5	43.0	15.1	36	5.2	3.5	12.4
pH	7.37	6.93	7.61	7.26	27.13	7.15	7.76	7.15	7.95	7.27	7.67	7.42	7.25	6.74	7.94	7.42
Specific Conductivity	382	437	549	498	539	589	401	589	805	643	684	726	412	291	698	467
TDS	248	284	356	324	350	382	300	382	524	418	446	472	268	190	454	302
Total Hardness (as $CaCO_3$)	142	144	168	182	146	194	156	194	236	244	192	224	122	102	244	146
Calcium	32.8	33.6	24.8	48	32	47.2	36	47.2	58.4	52	40.8	49.6	28.8	27.2	72.8	35.2
Magnesium	14.4	14.4	25.4	14.9	15.8	18.2	15.8	18.2	21.6	27.4	21.6	24	12	8.2	14.9	13.9
Sulphate (as SO_4)	12	12	16	18	18	20	13	20	22	22	23	28	18	14	22	18
Total Alkalinity	108	136	118	178	142	206	116	206	198	148	184	196	106	106	226	156
Chloride	21	39	41	28	25	51	19	51	52	53	35	43	28	21	27	44
Fluoride	0.14	0.16	0.42	0.17	0.35	0.13	0.26	0.13	0.25	0.22	0.42	0.48	0.22	0.18	0.17	0.32
Nitrate	2.5	3.4	2.5	3.2	6	21	4	2.1	40	18	46.0	38.6	7.2	2.6	4.5	13
Total Coliform	130	60	240	80	380	20	160	120	220	90	92	110	620	260	280	120
Faecal Coliform	14	10	26	12	48	140	18	140	42	10	8	16	220	160	130	14

DO	2.6	2.8	4.9	5.8	8	3.9	4.9	5.3	3.9	3	4.8	4.9	4.6	5.6	4.4	5.6
BOD	6.6	6.2	3.9	4.3	4.8	5.5	5.6	4.9	5.5	5	6.2	6.5	5.3	4.9	5.2	5.4
COD	64.3	66.3	32	34	30	47	67	69.6	47	51.4	52	54	46.8	46.5	40.2	42.4

3.1.18 BOD: BOD Value was maximum (6.6) during the rainy season at **Hatod** Pond compared to other pond and minimum (3.9) during the rainy season at **Kalbhairav pond**. Refer results in table no.01 and graph no.01.

3.1.19 COD: COD Value was maximum (69.6) during the winter season at **Depalpur** Pond compared to other pond and minimum (30) during the rainy season at **Devisagar pond.** Refer results in table no.01 and graph no.01.



Graph No. 01 Results of Water analysis of 08 pound during rainy and winter season

4 Conclusion :

This study investigated the physico-chemical parameters of eight ponds in Dist Dhar, Madhya Pradesh, India, during the rainy and winter seasons. The analysis revealed significant seasonal variations in parameters such as pH, dissolved oxygen, conductivity, and total hardness. These fluctuations highlight the dynamic nature of pond water quality and its susceptibility to seasonal influences.

The observed variations in physico-chemical parameters have implications for the ecological health of the ponds and the potential health risks for humans and animals using the water. During the rainy season, the ponds exhibited higher levels of nutrients and organic matter, potentially leading to algal blooms and oxygen depletion, which can harm aquatic life. Conversely, in the winter season, the water quality parameters showed a general improvement, indicating a more stable and favorable environment for aquatic organisms.

These findings underscore the importance of continuous monitoring of pond water quality to ensure its suitability for various uses. Regular monitoring of physico-chemical parameters can help identify potential water quality issues, enabling early interventions to mitigate adverse impacts on aquatic ecosystems and human health. The results of this study provide valuable insights into the seasonal dynamics of pond water quality in Dist Dhar, Madhya Pradesh, and highlight the need for comprehensive management strategies to protect these vital water bodies.

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