



PADDY FIELD WATER ANALYSIS IN WARORA TALUKA, CHANDRAPUR

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ABSTRACT:

We discuss the Physico-chemical parameters of different paddy field water from six sampling sites such as Sumthana, Jamani (BK), Chargaon (KH), Shegaon, Mesa, Salori, were studied during the month of June 2023 to October 2023. The physical parameters such as Total Dissolved Solid, Electrical Conductivity, Temperature, pH, and Chemical parameters such as Dissolved Oxygen, Alkalinity, Chloride, Sulphate, BOD and COD Calcium Hardness, Total Hardness, Sodium, Potassium, were studied in the laboratory by using Standard Protocol. The study aims to assess the quality of irrigation water and its impact on paddy crop growth. The results indicated minor spatial variation in the parameters, suggesting that the physicochemical properties of the field water are influenced by fertilizer input, soil type, and agricultural management. Overall, the water quality parameters were within the permissible limits for paddy cultivation, though sites near fertilizer application zones exhibited elevated nutrient concentrations.

Keywords:- Paddy field, TDS, Dissolved oxygen (DO), pH, Water quality, Physico-chemical Parameters

INTRODUCTION:

Paddy cultivation requires continuous submergence of fields, which significantly affects properties of physicochemical water. Monitoring these properties provides insight into nutrient dynamics, water quality, and ecosystem balance. Variations in pH, temperature, dissolved oxygen, and nutrient levels influence the microbial activity and nutrient availability that affect crop yield. This research investigates six sampling sites from a paddy ecosystem to evaluate the influence of agricultural practices and environmental conditions on water quality parameters. Such analysis supports sustainable management of paddy cultivation and water resources. Every plant needs soil for standing and water for living; plants can uptake the nutrients from the soil. All living organisms need water for surviving. In our ecosystem, water plays the most important role in life cycle processes. Also, in water, many important nutrients are present

that are important for living things. Paddy water has some physicochemical properties.

OBJECTIVE:

To analyze the physicochemical parameters of Paddy Field Water sample in six different selected sites of Warora tehsil.

MATERIAL AND METHOD :

Study area:

- Warora taluka is situated in the western part of Chandrapur District of Maharashtra State, lying between the latitude 20° and 23° north and longitudinal of 79° and 80° east and it extends over an area of 22.50 km². Average rainfall of the taluka is 1200 mm with maximum temperature of 48°C in summer and it is about 10°C in winter.
- I have collected Paddy field water samples from different selected areas. I have selected six different sites for study: Site A-Salori area, Site B- Mesa area, Site C- Shegaon (BK), Site D- Chargaon (KH), Site E- Jamani (BK) and Site F- Sumthana.



| Site area | Site name | Away from warora tehsil | Latitude | Longitude |
|---------------|------------------------|-------------------------|------------|------------|
| Salori | Site A- Salori | 11 km | 20.3030 °N | 79.0702 °E |
| Mesa | Site B- Mesa | 14 km | 20.3181 °N | 79.1178 °E |
| Shegaon(BK) | Site C- Shegaon (BK) | 17 km | 20.3299 °N | 79.1478 °E |
| Chargaon (KH) | Site D – Chargaon (KH) | 23 km | 20.3608 °N | 79.1838 °E |
| Jamani (BK) | Site E- Jamani (BK) | 16 km | 20.3580 °N | 78.9815 °E |
| Sumthana | Site F - Sumthana | 23 km | 20.4143 °N | 79.0765 °E |

Plate No. 1- Showing Sites selected for Paddy Field Water for Physicochemical analysis

Physicochemical analysis

❑ Collection of Paddy Field Water Sample

- Paddy field water sample were collected in the month of June 2023 to October 2023 of Six different selected site.
- The paddy water is collected in two liter well labelled plastic bottles.
- For further analysis bring into the laboratory.

COLLECTED PADDY FIELD WATER SAMPLES OF SITE A- SALORI, B- MESA, C- SHEGAON(BK), D- CHARGAON(KH), E- JAMANI(BK), F- SUMTHANA



| SR.N O | PARAMETER OF PADDY FIELD WATER | UNIT | AVERA GE VALUE | | | | | |
|-----------|--------------------------------------|-------------------|----------------------|---------------------|---------------------|--------------------------------|--------------------------------|-------------------------------|
| | | | | SITE A SALO-RI | SITE B MESA | SITE C SHE- GAON (BK) | SITE D CHAR GAON (KH) | SITE E JAMA- NI (BK) |
| 1 | Temperature | °C | 25.9 ± 0.43 | 25.9 ± 0.49 | 26.3 ± 0.25 | 26.1 ± 0.31 | 26.3 ± 0.28 | 26 ± 0.71 |
| 2 | pH | - | 7.6 ± 0.15 | 7.1 ± 0.27 | 7.8 ± 0.23 | 8 ± 0.23 | 7.4 ± 0.29 | 7.6 ± 0.49 |
| 3 | Dissolved Oxygen(DO) | mg/L | 4.25 ± 0.62 | 3.45 ± 0.30 | 6.55 ± 0.36 | 5.1 ± 0.33 | 5.4 ± 0.33 | 5.4 ± 0.47 |
| 4 | Suspended Solids (SS) | mg/L | 190 ± 4.81 | 325.5 ± 12.94 | 11.5 ± 2.86 | 62.5 ± 3.50 | 27.5 ± 2.86 | 35 ± 5.71 |
| 5 | Total Dissolved Solid (TDS) | mg/L | 325.5 ± 19.99 | 94 ± 10.89 | 840 ± 10.75 | 569 ± 6.09 | 358.5 ± 6.51 | 344.5 ± 3.34 |
| 6 | Total Solids (TS) | mg/L | 515.5 ± 24.64 | 419.5 ± 23.83 | 851.5 ± 13.75 | 631.5 ± 9.44 | 386 ± 9.33 | 379.5 ± 8.97 |
| 7 | Alkalinity | mg CaCO3 /L | 210 ± 13.36 | 59 ± 8.87 | 524 ± 3.80 | 355.5 ± 3.64 | 219.5 ± 4.43 | 215.5 ± 6.04 |

Plate no. 2- Showing Physicochemical Parameters of Paddy Field Water Analysis of Warora Taluka

| SR.N O | PARAMETER OF PADDY FIELD WATER | UNIT | AVERA- GE VALUE | | | | | |
|-----------|--------------------------------------|-------------------|-----------------------|--------------------|--------------------|--------------------------------|--------------------------------|-------------------------------|
| | | | | SITE A SALO-RI | SITE B MESA | SITE C SHE- GAON (BK) | SITE D CHAR GAON (KH) | SITE E JAMA- NI (BK) |
| 8 | Bi carbonate | mg CaCO3/ L | 246 ± 14.38 | 71.45 ± 2.11 | 639.5 ± 3.64 | 435 ± 3.19 | 267 ± 4.94 | 261.5 ± 6.83 |
| 9 | Chloride | mg/L | 33.5 ± 5.45 | 8.75 ± 0.39 | 86.2 ± 0.23 | 55.45 ± 0.27 | 36 ± 0.72 | 32 ± 0.79 |
| 10 | Sulphate | mg/L | 25.15 ± 1.72 | 6.2 ± 0.25 | 58.65 ± 0.20 | 36.45 ± 0.28 | 29.25 ± 0.43 | 26.45 ± 0.48 |

| | | | | | | | | |
|----|------------------------|-------------------|---------------------|----------------------|----------------------|---------------------|----------------------|----------------------|
| 11 | COD | mg/L | 72.5 ± 7.03 | 85.5 ± 4.91 | 32.5 ± 2.07 | 46 ± 3.27 | 40 ± 3.96 | 36 ± 3.80 |
| 12 | Total Phosphorous | mg/L | 0.217 ± 0.013 | 0.1065 ± 0.004 | 0.3225 ± 0.003 | 0.255 ± 0.003 | 0.1905 ± 0.005 | 0.1805 ± 0.007 |
| 13 | Free CO2 | mg/L | 20.7 ± 1.11 | 28.3 ± 0.35 | 17.45 ± 0.27 | 10.5 ± 0.23 | 17.5 ± 0.31 | 21 ± 0.63 |
| 14 | Total hardness | mg CaCO3/ L | 213.5 ± 17.78 | 61.5 ± 3.492 | 544 ± 4.21 | 317 ± 6.46 | 234 ± 4.97 | 224 ± 4.74 |
| 15 | Ammoniacal Nitrogen | mg/L | 0.34 ± 0.05 | 0.435 ± 0.34 | 0.15 ± 0.03 | 0.255 ± 0.03 | 0.195 ± 0.04 | 0.195 ± 0.07 |

Plate no. 3- Showing Physicochemical Parameters of Paddy Field Water Analysis of Warora Taluka

PLATE NO. 4, 5, 6, 7, 8, 9, 10 Showing Graphical Representation of Physicochemical Parameter of Paddy Field Water of Warora Taluka

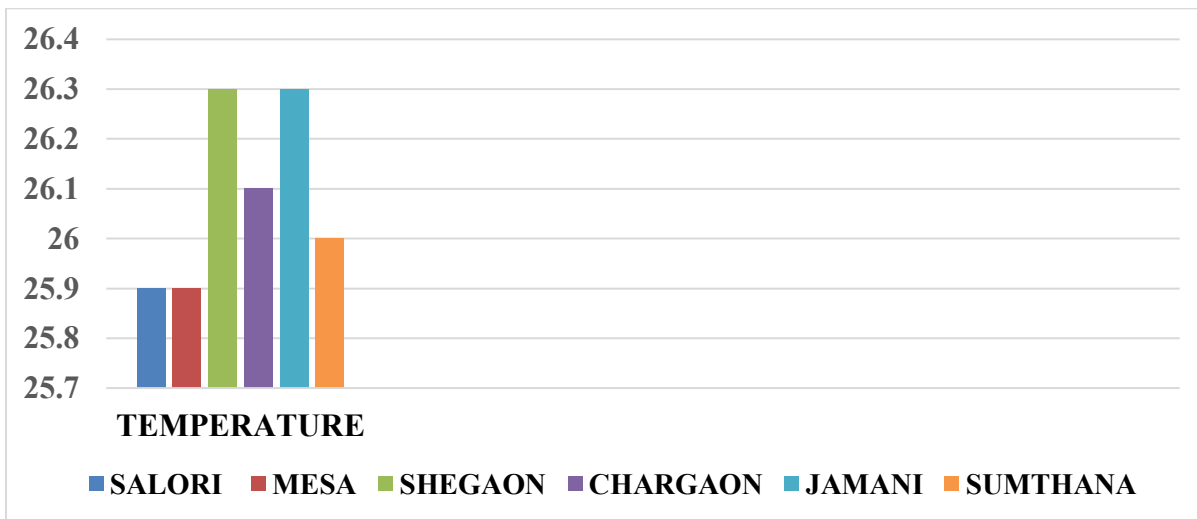


PLATE NO. 4- SHOWING AVERAGE VALUE OF TEMPERATURE OF PADDY FIELD WATER

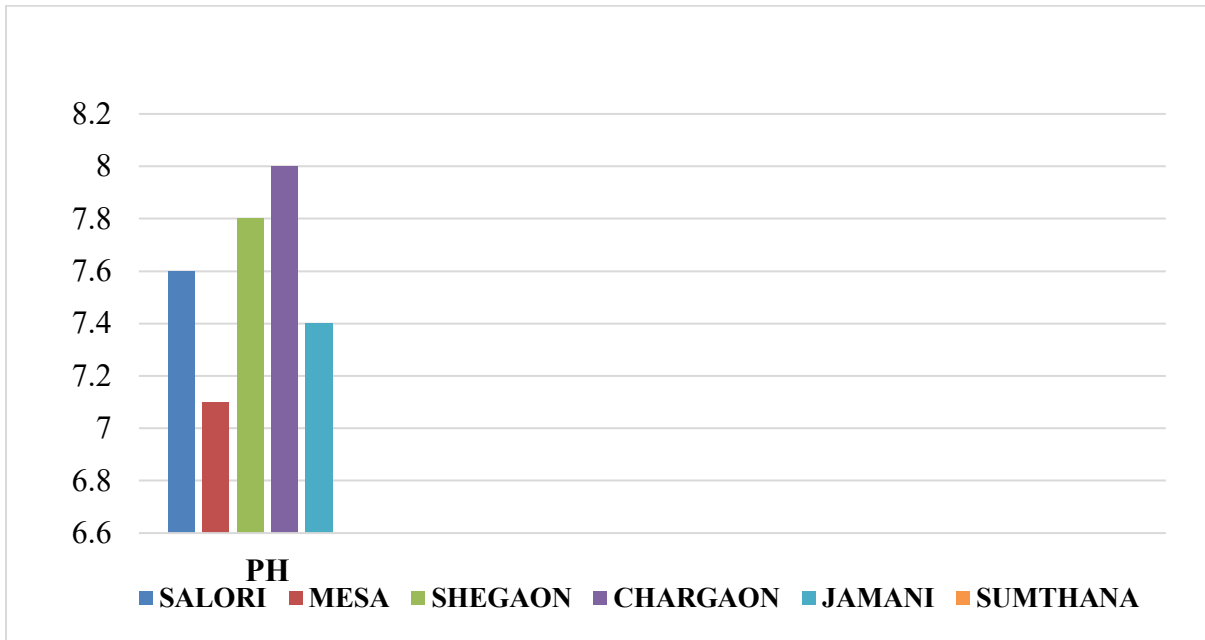


PLATE NO. 5 - SHOWING AVERAGE VALUE OF pH OF PADDY FIELD WATER

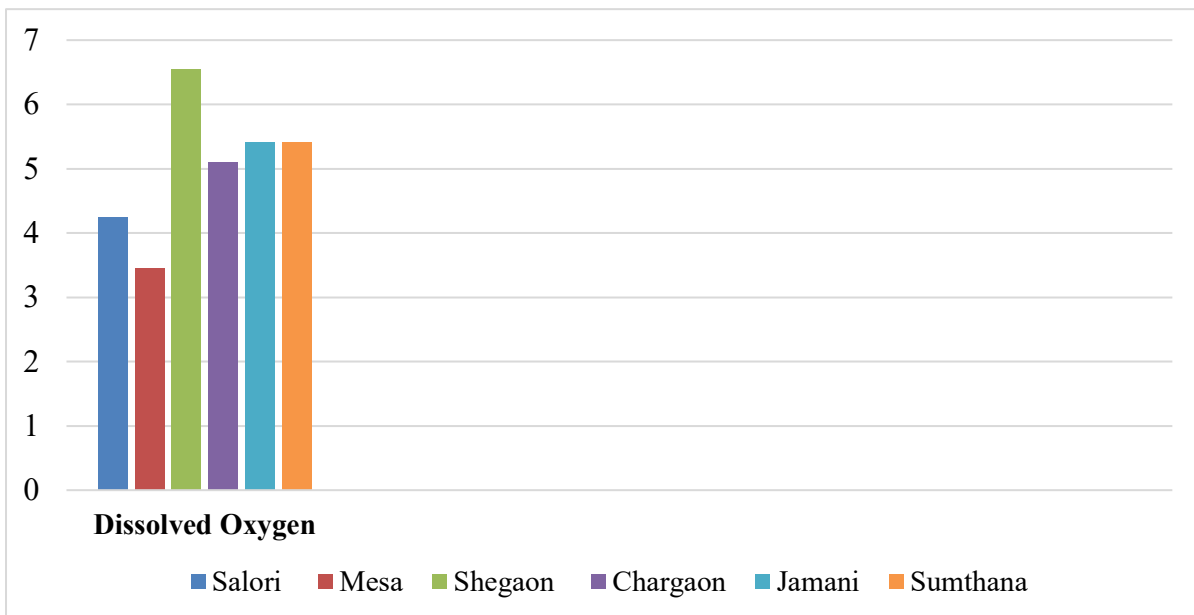


PLATE NO. 6 - SHOWING AVERAGE VALUE OF DISSLOVED OXYGEN OF PADDY FIELD WATER

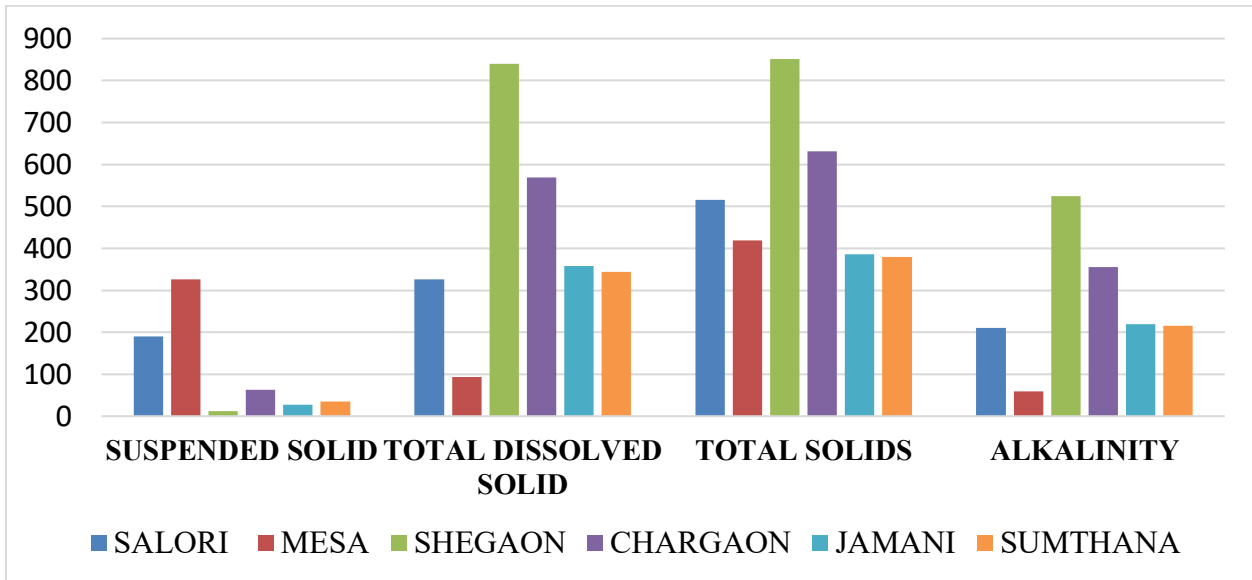


PLATE NO. 7- SHOWING AVERAGE VALUE OF Suspended Solids, Total Dissolved Solids, Total Solids and Alkalinity OF PADDY FIELD WATER

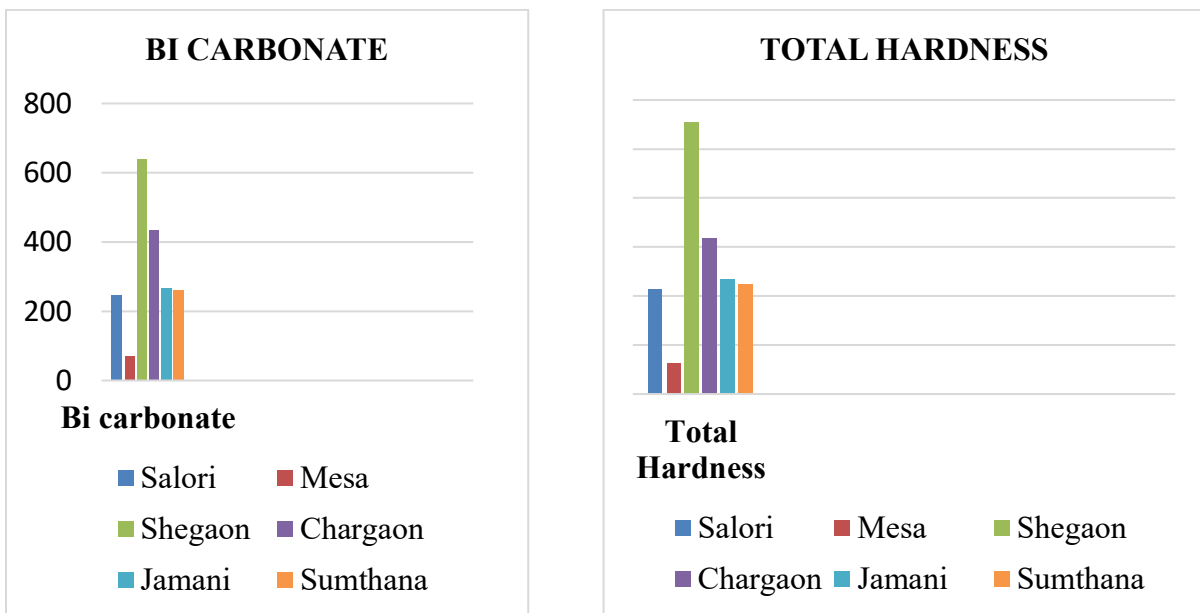


PLATE NO. 8- SHOWING AVERAGE VALUE OF Bi carbonate And Total Hardness OF PADDY FIELD WATER

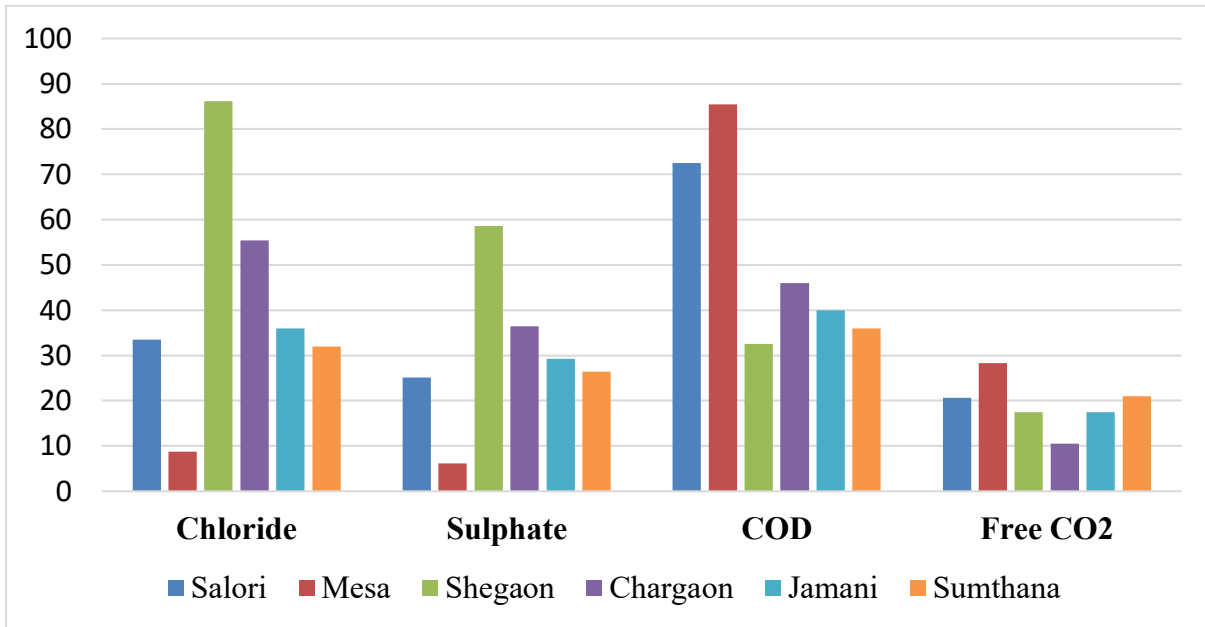


PLATE NO. 9 - SHOWING AVERAGE VALUE OF Chloride, Sulphate, COD, Free CO2 , OF PADDY FIELD WATER

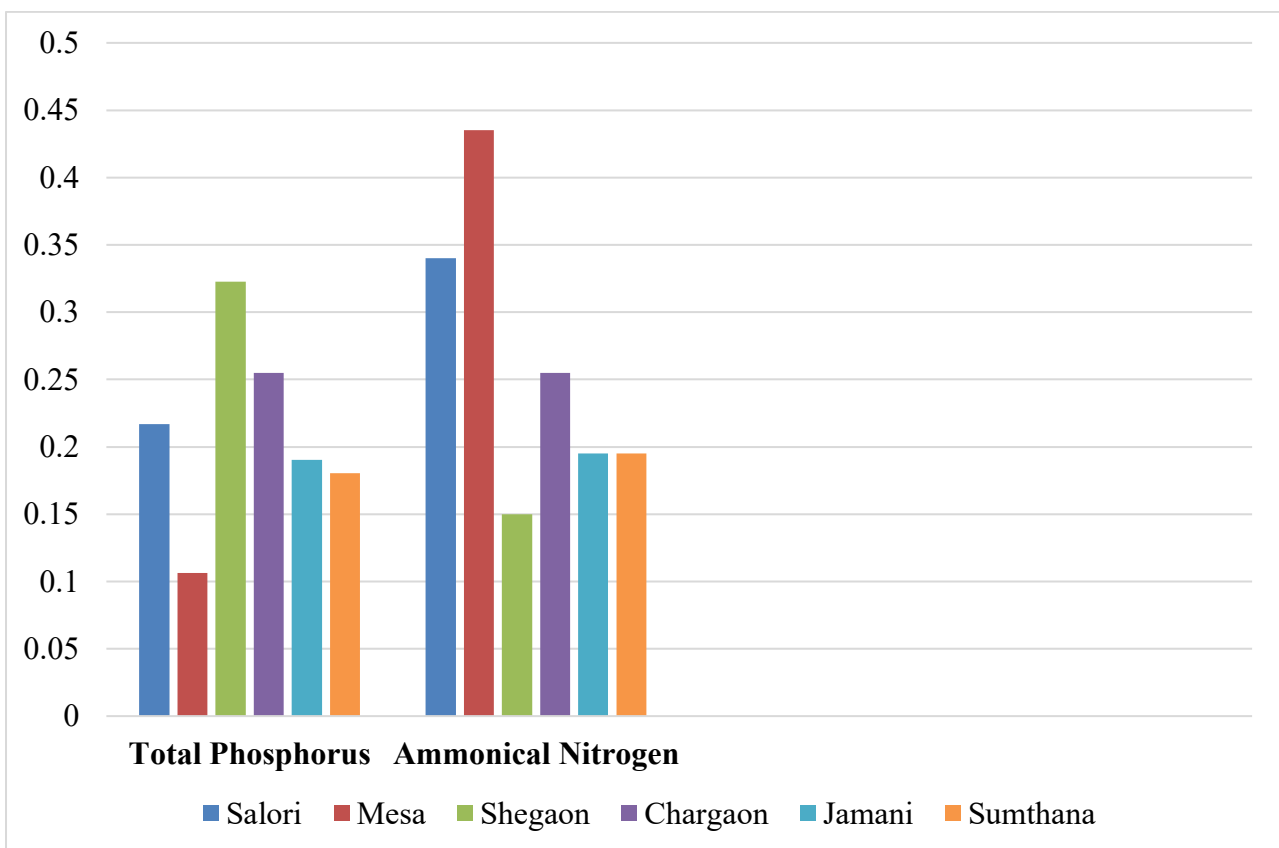


PLATE NO. 10 - SHOWING AVERAGE VALUE OF Total Phosphorus, Ammoniacal Nitrogen OF PADDY FIELD WATER

| SR NO. | PARAMETER OF PADDY FIELD WATER | METHOD |
|--------|--------------------------------|--|
| 1 | Temperature | Thermometer |
| 2 | pH | Potentiometric method |
| 3 | Dissolved oxygen (DO) | Winkler Azide modification titrimetric |
| 4 | Suspended Solids(SS) | Gravimetric analysis |
| 5 | Total dissolved solid | Gravimetric after filtration method |
| 6 | Total Solids(TS) | Gravimetric method |
| 7 | Alkalinity | Titration method |
| 8 | Chloride | Argenometric titration |
| 9 | Sulphate | Nephelometry |
| 10 | Chemical Oxygen Demand (COD) | Open Reflux method |
| 11 | Total Phosphorus | Spectrophotometry |
| 12 | Total Hardness | EDTA Titrimetric |
| 13 | Ammoniacal Nitrogen | Kit method |

PLATE NO. 11- METHODS USED FOR THE ESTIMATION OF PADDY FIELD WATER

DISCUSSION:

DISCUSSION

The physicochemical characteristics of the paddy field water reflect interactions among soil minerals, fertilizer inputs, and hydrological conditions. Below is a parameter-by-parameter comparison with findings reported in other studies.

1. **Temperature** :-The average temperature of paddy field water was ranges between 25.9° C to 26.3° C. The maximum temperature was recorded in site C Shegaon and site E Jamani and minimum in site A Salori and site B Mesa. Such temperatures affect dissolved oxygen solubility and microbial decomposition rates. A water temperature simulation model for rice paddies with variable water depths (Kazuhiro Nishida et al. 2022) reports that the spatial average water temperature in a paddy field for one case ranged from 26.2 °C to 27.9 ° C.
2. **pH** :-The average pH ranges between 7.1 to 8 observed in the present study are comparable to those reported (Singh et al. 2020) and (Rahman et al. 2019), who found pH values between 6.8 and 8.2 in paddy field and irrigation waters, indicating slightly alkaline conditions favorable for rice cultivation. The lowest pH was recorded in site B Mesa and highest pH in site C Shegaon (BK). The pH value is above 7.2 in all five sites it is alkaline in nature. Slightly alkaline and favorable for rice.
3. **Dissolved Oxygen (DO)**:- The DO was found to be range between 3.4 g/L to 6.55mg/L. (Chandra et al. 2019) and (Islam et al. 2021), who recorded DO concentrations between 3.0 and 7.0 mg/L in paddy field irrigation waters, reflecting moderate aeration and biological activity typical of flooded rice ecosystem, The lowest DO were found in Mesa and highest DO were found in

Shegaon. Good aeration consistent with active aquatic ecosystems.

4. **Suspended Solid (SS):-** Suspended Solid (SS) were found to be range between 11.5mg/L to 325.5mg/L Observed in the present study are comparable to those reported (kumar et. Al. 2018) and (Bhatnagar & Sangwan 2009), who recorded suspended solids in the range of 10 to 300 mg/L in paddy field and irrigation waters of similar physicochemical conditions. The lowest SS were found in site C Shegaon and highest SS were found in site B Mesa.
5. **Total Dissolved Solid (TDS):-** The TDS Was found to be between 94mg/L to 840 mg/L. The lowest TDS found in site B Mesa and Highest TDS found in site C Shegaon. The high and low concentration of TDS may limit the growth and lead the death of many aquatic organisms. Seasonal losses of dissolved organic carbon and total dissolved solids from rice production systems in Northen California (Ruark et al., 2014) this study in rice fields reports that typical agricultural water shed from DS values are between 250 and 500 mg/L.
6. **Total Solids (TS):-** The Total Solids (TS) were ranges between 386 mg/L to 851.5 mg/L are comparable to Jena et al. (2017) and Patel et al. (2020), who recorded total solids between 400 and 900 mg/L in paddy field and irrigation waters, indicating moderate levels of dissolved and suspended materials derived from soil erosion and agricultural runoff. The lowest TS found in site E Jamani and highest TS found in site C Shegaon.
7. **Alkalinity:-** The Alkalinity of paddy water were found to be 59 mg CaCO₃/L to 524 mg CaCO₃/L is comparable to those reported for paddy field waters (Mohanty et al. 2014), (Saha et al. 2019), and (Nguyen et al. 2021). who recorded alkalinity values ranges between 84-156 mg CaCO₃/L, 68-210 mg CaCO₃/L, and 75-240 mg CaCO₃/L, respectively, in rice cultivation fields under varing irrigation and soil conditions. The low alkalinity were found in site B Mesa and high alkalinity in site C Shegaon. Suggests buffering capacity largely due to carbonates and bicarbonates.
8. **Bicarbonate:-** The Bicarbonate ranges between 71.45 mg CaCO₃/L to 639.5 mg CaCO₃/L. (Mohanty et al. 2014), (Saha et al. 2019), and (Nguyen et al. 2021), who recorded bicarbonate values ranges between 60-185 mg CaCO₃/L, 54-170 mg CaCO₃/L, and 65-190 mg CaCO₃/L, respectively, in rice cultivation fields under different irrigation and soil conditions. In site B Mesa the lowest bicarbonate were found and highest bicarbonate in site C Shegaon.
9. **Chloride:-** The Chloride value ranges between 8.75mg/L to 86.2mg/L. (Mohanty et al. 2014), (Saha et al. 2019), and (Nguyen et al. 2021), who recorded Chloride values ranges between 10-92 mg/L, 12-110 mg/L, and 15-95 mg/L, respectively, in rice fields water under different irrigation and management conditions. the lowest value were found in site B Mesa and highest value in site C Shegaon. Well below problematic thresholds (Manvisakam, 2011 reports crop stress often at much higher chloride levels), indicating no chloride- induced salinity or toxicity concerns.
11. **Chemical Oxygen Demand (COD):-** The COD was found to be 32.5mg/L to 85.5mg/L. (Mohanty et al. 2014), (Saha et al. 2019), and (Nguyen et al. 2021), who recorded COD values ranges between 28-82 mg/L, 30-95 mg/L, and 25-88 mg/L, respectively, in rice fields water under different irrigation and fertilization conditions. The lowest COD found in site C Shegaon and Highest COD found in site B

Mesa. The higher value indicates the evaporation of water during rainy and low in winter season to dilution by rainwater. Reflects total oxidizable organic matter.

12. **Total Phosphorus:-** The Total Phosphorus of paddy water ranges between 0.10 mg/L to 0.32mg/L. (Choudhury et al. 2017), (Saha et al. 2019), and (Hossain et al. 2020), who recorded Total phosphorus values ranges between 0.10-0.28 mg/L, 0.09-0.35 mg/L, and 0.11-0.30 mg/L, respectively, in rice fields water under different irrigation and fertilization conditions. In site B Mesa total phosphorus is low and high in site C Shegaon.
13. **free CO₂:-** The free CO₂ ranges between 10.5mg/L to 28.3mg/L. (Saikia et al. 2015), (Das et al. 2014), and (Saikia & Das 2015) , who reported free CO₂ ranges of 9.7-23.35 mg/L, 1.0-19.9 mg/L and 11.7-21.6 mg/L, respectively, in rice-fish and other paddy systems under varying management and altitudinal conditions. In site D Chargaon low Free CO₂ and site B Mesa high free CO₂ was found.
14. **Total hardness:-** The total hardness of paddy water ranges between 61.5mg CaCO₃/L to 544mg CaCO₃/L were found was comparable to those reported for paddy-field waters (Mohanty et al. 2014), (Saha et al. 2019), and (Hossain et al. 2020), who recorded total hardness values ranging between 72-420 mg CaCO₃/L, 65-380 mg CaCO₃/L, and 70-450 mg CaCO₃/L, respectively. In site B Mesa minimum value and site C Shegaon maximum value found. Represent moderate hardness contributed by calcium and magnesium.
15. **Ammoniacal Nitrogen:-** In paddy water Ammoniacal Nitrogen ranges between was found to be 0.15 mg/L to 0.43 mg/L were found comparable to those reported (Saiki et al. 2020). Who observed 0.16-0.30 mg/L,

similarly, Alam et al. (2023) reported that floodwater ammonium concentrations in managed paddy systems generally range between 0.10 – 0.50 mg/L, depending on fertilizer timing and water management practices. The lowest was recorded In site C Shegaon and highest in site B Mesa. Nitrogen plays very important role in metabolism, growth, protein and nucleic acid formation.

Overall, the dataset closely matches the ranges and trends reported by multiple Indian studies across different regions (Das et al., Bhatnagar & Devi, Kumar et al., Choudhary et al., Manivasakam). Differences among studies typically reflect local soil mineralogy, timing of sampling (pre/post-fertilizer or monsoon), and irrigation practices. Our results therefore indicate paddy field water that is chemically suitable for irrigation and comparable to other well- documented agricultural water studies in India.

CONCLUSION:

The comparative analysis of fifteen physicochemical parameters shows the paddy field water assessed in this study is suitable for irrigation. Values are within acceptable limits and align with results from other peer-reviewed studies, indicating balanced nutrient status and minimal salinity or organic pollution concerns. Regular monitoring is recommended to manage seasonal nutrient fluctuations and ensure long-term soil and water health.

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