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ANALYSIS OF PHYSICO-CHEMICAL PARAMETERS IN SEA WATERS OF TUTICORIN AND RAMESWARAM DISTRICT DURING POST MONSOON SEASON

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ABSTRACT

The aim of the present study was to establish the physico-chemical properties in sea waters of Tuticorin and Rameswaram district during Post Monsoon Season. These marine ecosystems have become the privileged receptacle of pollution because of the anthropogenic development which discharge wastewaters in many points of marine coasts. Such situation requires the establishment of a sustainable strategy for monitoring and protecting the environment. In order to preserve these coastal environments and their resources, four distinct study sites were chosen and their physico-chemical properties were analyzed. The findings revealed that pollution has a significant impact on study site 2 during Post Monsoon Season. These results may be used as a potential test analysis to track sea water characteristics at specific locations.

KEYWORDS

Undesirable change, Physico-chemical properties, Post monsoon, Coastal environment and One-Way ANOVA.

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INTRODUCTON

Marine ecosystems are the largest ecosystem forms on the planet. The physical and chemical properties of seawater differ by latitude, depth and freshwater input. The availability of good quality water is an indispensable feature for preventing disease and improving quality of life. The Physico-chemical properties will also help in the identification of sources of pollution, for conducting further investigations on the eco-biological impacts and also for initiating necessary steps for remedial actions in case of polluted water bodies[1,2]. Aquatic ecosystems are particularly vulnerable to environmental change and many areat present, severely degraded[3]. In recent years, a number of

industries have been developed around Tuticorin and Rameswaram coastal region. The effluents from these industries and aquaculture are discharged into sea water. Hence, the present study was undertaken to assess the water quality of these two coastal water through analysis of physico-chemical parameters of water samples collected from four different stations with a view to know the pollution status and to predict its possible impact for future management. Around 3.5 percent of sea water consists of dissolved chemicals, while pure water accounts for the other 96.5 percent. Nitrogen and phosphorus, which are minor constituents of sea water and are thus often limiting factors in the organic cycles of the ocean, are nutrients important for living organisms in addition to biomass.

As a consequence of the degradation of life, the highest concentrations of these nutrients are typically located below 500 meters. Fish are the most publicly recognized generators of marine ecosystem services[4] and marine cultural services; notably tourism associated with Coral reefs and sandy beaches have been a primary focus[5]. Marine environments provide a wide array of benefits including global gas and climate regulation, nutrient regulation, carbon storage, waste treatment processing, coastal protection, genetic and medicinal resources, recreation opportunities, spiritual fulfillment, and cultural identity[6-10]. The healthy aquatic ecosystem depends on the physico-chemical and biological characteristics[11]. As evidenced by changes in temperature, currents and sea level rise, all of which impact the health of marine species, near shore and deep ocean ecosystems, the ocean also bears the brunt of climate change.

Climate change contributes to increases in SST (Sea Surface Temperature) through heat accumulation at the ocean surface; furthermore, changes in evaporation inherently cause changes in the frequency of precipitation, thereby increasing the magnitude of river discharge, which in turn forms storms and typhoons. Climate change and typhoons markedly influence both ocean and coastal marine ecosystems[12]. The global ocean is already experiencing the significant impact of climate change and its associated effects. Climate change is destabilizing ecosystem food webs and threatening these services[13,14], other effects include increased terrestrial dissolved organic carbon (DOC) loading into sea shore ecosystems, altering Primary Productivity[15] ;increased acidification and ocean warming, affecting shell-forming species[16]; and synergistic effects of invasive species, overfishing , and climate change[17].

Heavy metal pollution of the biosphere has accelerated dramatically since the beginning of the industrial revolution[18]. Heavy metals are metals with specific gravity greater than 5g/Cm3 (cube)[19]. High levels of Cd, Cu, Pb and Fe can act as ecological toxins in aquatic and terrestrial ecosystems[20,21]. In aquatic ecosystems, heavy metal contamination due to the discharge of industrial effluents may pose a serious threat to human health. A steady increase in pollutants and pollution is created by an increasing population and human interference. All these factors favor the growth of harmful bacteria. This causes the water to become toxic to the organisms that live in it, and microbe growth and survival are interlinked with water's chemical and physical properties for those who consume it. Physico chemical properties of the Marine environment will play a dynamic role in determining the type of ecosystems[22]. Changes in the Physico-chemical parameters provide valuable information on the quality of water[23]. Physico-chemical and Micro-biological characteristics may describe the quality of water[24]. During the monsoon, the occurrence of diseases increases dramatically. To prevent or limit these occurrences, the reason must be identified. Water's microbiological and physicochemical qualities must therefore be investigated.

MATERIAL AND METHODS

Study Site

Four study sites were selected for the current project. Area I of the study is located in Periyathalai (Tuticorin District), Area II of the study is located in Hare Island (Tuticorin District), Area III of the study is located in New Harbour (Tuticorin District), Area IV of the study is located in Mandapam (Rameswaram District) (Plate No.1-4).

METHODOLOGY

Sample Collection

Marine water was sampled seasonally in each site between October 2019 and November 2019. In this study, four water samples were collected: Sample one from Periyathalai (Plate No.1), sample two from Hare Island (Plate No.2), sample three from New Harbour, Tuticorin District (Plate No.3), and sample four from Mandapam (Plate No.4). Polyethylene bottles that had already been soaked in 5M HCL for more than three days and rinsed with distilled-deionized water were used to collect the water samples.

Analysis of physicochemical parameters

The samples obtained were taken to the lab and held for further analysis at 37ºC. The different physico-chemical parameters of sea water were analyzed using the "standard methods for the examination of water". Temperature, pH, Colour, Turbidity, EC (Electrical Conductivity), TDS (Total Dissolved Solids), Odour are physical parameters.

Total Hardness, Calcium Hardness, Magnesium Hardness, Nitrate, Dissolved Oxygen, Potassium, Sodium, Sulphate, Chloride, Nitrogen, Phosphorus, BOD (Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand) are chemical parameters.

By means of an electronic portable pH meter, the pH of the water sample was measured. Visual contrast of sea water with pond water is used to assess the colour of the sample. Similarly, 4 different water temperatures were measured using thermometers. Similarly, a turbidity meter was used to measure the turbidity in 4 distinct marine waters. Using a wireless conductivity meter, the electrical conductivity of sea water from four separate sites was measured. It tabulated the findings. Using an automated TDS meter, the gross dissolved solid levels of 4 different water samples were analysed. It noticed the outcomes.

Total Hardness, Calcium Hardness, Magnesium Hardness, Nitrate, Dissolved Oxygen, Potassium, Sodium, Sulphate, Chloride, Free Carbondioxide, Nitrogen, Phosphorus, BOD (Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand) are chemical parameters. The total water hardness is estimated using the Eriochrome Black-T (EBT) indicator by titrating the water sample against normal 0.01M EDTA before the solution's wine red color turns light blue at the end stage. In a clean conical flask, a known volume (50ml) of the sample is pipetted to which 1ml of sodium hydroxide and 1ml of isopropyl alcohol are added. To this mixture, a pinch of murexide indicator is applied and titrated against EDTA until the pink color becomes purple. Complexometric titration was used to accomplish the Total water hardness and Calcium hardness. From the determined total hardness and calcium hardness, magnesium hardness can be measured. The Phenol disulphonic technique tests nitrate.

The Winkler process tests dissolved oxygen. Via direct reading of the Colorimetry, potassium can be calculated. (The sample is filtered and fed into the Colorimetry via the filter paper). The Colorimetric method measures sodium. Sulphate is measured using a turbidometric process. The Argentometric method measures chloride. Free carbon dioxide is measured by calculating the known volume (50ml) of the sample in the conical flask. Nitrogen Process Estimate - The 5ml water sample was taken from the clean test tube and combined with the Doctor-N Capsule. The solution was thoroughly combined, until the chemical had been dissolved. For colour growth, the tube was kept at room temperature for 20 minutes. To find out the concentration of the sample, the colour formation was referred to the specified reference map. Phosphorus Process Estimation -The 5ml water sample was taken from a clean test tube and combined with the Doctor-P capsule. The solution was thoroughly combined, until the chemical had been dissolved. Four drops of TCA reagent were then carefully applied and well blended. For colour growth, the tube was kept at room temperature for 20 minutes. To find out the concentration of the sample, the colour formation was referred to the specified reference map. The 5-Day BOD Test and the Closed Reflux, Colorimetric Method were used to determine BOD and COD, respectively. Following that, the BOD (Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand) values are calculated.

Statistical Analysis

The results of Physical parameters were statistically analyzed using one-way ANOVA. Hypothesis is significant. Mean of pH, Temperature, Electrical conductivity, TDS, Turbidity, Odour, Color for four

samples are same. The p-value obtained is 3.98 more than the alpha value with these I conclude that my hypothesis is accepted. Using one-way ANOVA, Chemical parameters data were statistically analyzed. Hypothesis is significant mean of Total Hardness, Calcium Hardness, Magnesium Hardness, Nitrate, Dissolved Oxygen, Potassium, Sodium, Sulphate, Chloride, Free Carbondioxide, Nitrogen, Phosphorus, BOD (Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand) for four samples are same. The p-value obtained is 3.98 more than the alpha value with these I conclude that my hypothesis is accepted.

RESULTS AND DISCUSSION

Study Site

Study Site I - Periyathalai (Study Site I) is a coastal hamlet situated in Tamilnadu, on the southern side of the Tuticorin District. The coast is about 35km south of the temple of Thiruchendur. Due to the presence of the island nation, Srilanka, this area is protected from northern and eastern waves.

Study Site II (Study Site II), Hare Island, is an island adjacent to the Port of Tuticorin. For holiday seekers and domestic visitors, it is a very good picnic spot. Among visitors, Hare Island is also known as Pandyan Theevu.

The beach situated close to the harbour guest house is Study Site III- New Harbour, Tuticorin District (Study Site III), Tuticorin. Near it, there is also a park where people can walk in the evenings, amid the soothing sea breeze. Today, the park is a popular tourist spot.

Study Site IV-Rameswaram Mandapam Beach (Study Site IV) is situated in Mandapam, the main land connected to Rameswaram Island. This beach is the gateway to a number of tiny islands. This beach is peaceful, with long stretches of sand.

Plate 5: Study Sites

Physico-chemical Parameters

During the Post-Monsoon Season research period, which runs from October to December 2019, the following Physico-chemical parameters have been evaluated for all the four marine water samples MW 1, MW 2, MW 3 and MW 4. The findings of pH, Colour, Temperature, Turbidity, EC (Electrical Conductivity), TDS (Total Dissolved Solids), Odour. Total Hardness, Calcium Hardness, Magnesium Hardness, Nitrate, Dissolved Oxygen, Potassium, Sodium, Sulphate, Chloride, Free Carbondioxide, Nitrogen, Phosphorus, BOD (Biochemical Oxygen Demand) and COD (Chemical Oxygen Demand) is represented in Table No.3 and Table No.4.

Physical parameters of Sea Water

The physical parameters of all the four study sites are represented in figures (Figure No.1-5).

Figure No.1 depicts the Acidic pH in each of the four samples.

When compared to MW2, the temperatures of MW1, MW3, and MW 4 are nearly same.

In comparison to the other three samples, MW 4 had a significant level of EC (Figure No.3).

In Figure No.4, four samples have almost the same level of Total Dissolved Solid, although MW 3 and MW 4 have a higher amount of Total Dissolved Solid (TDS) than MW 1 and MW 2.

Figure No.5 demonstrates that MW 2 and MW 3 have the same percentage of turbidity.

Chemical Parameters of Sea Water

The Chemical parameters of all the four study sites are represented in figures (Figure No.6-19).

In comparison to the other samples, the hardness of the water in MW1 is high (Figure No.6).

The calcium hardness of MW 2 is shown in Figure No.7. MW 1, MW 3, MW 4 has a significant amount of calcium in contrast to MW 2.

Magnesium was found in abundance in MW 2. In comparison to MW 2, MW 1, MW3, MW 4 has a considerable amount of Magnesium (Figure No.8).

Figure No.9 shows that the amounts of Nitrate in MW 1, MW 2, and MW 3 are the same.

Figure No.10 shows that the presence of dissolved oxygen in MW 1 is higher than in the other three samples.

According to Figure No.11, the MW 3 has the highest amount of free carbondioxide.

In comparison to the other three samples, MW 2 had the highest level of potassium (Figure No.12).

In MW 2, a high amount of sodium was found, as seen in Figure No.13. The lowest level of sodium was found in MW 1, MW 3, MW 4.

The high amount of Sulphate was discovered in MW 2 as shown in Figure No.14. The differences between MW 1 and MW 4 are minor. In

comparison to the other three samples, MW 3 had a low quantity of Sulphate.

Figure No.15 demonstrates that MW 1 contained the most chloride. The level of Chloride in the other three samples was quite low.

Figure No.16 shows that the same quantity of nitrogen was found in all four samples.

Figure No.17 shows that MW 2 and MW 3 have the same quantity of Phosphorus. The amount of Phosphorus in MW 4 is lower.

In comparison to the other three samples, MW 4 has a high level of BOD (see Figure No.18).

In comparison to the other three samples, the MW 4 exhibited the highest COD level (Figure No.19).

DISCUSSION

For four different sites of sea water, physico-chemical properties were examined. The physico-chemical characteristics indicating the pressure of sea water vary a lot[30]. pH, colour, temperature, turbidity, EC (Electrical Conductivity), TDS (Total Dissolved Solids), and odour are all factors to consider. The average pH of sea water is currently approximately 8.1 due to human-caused elevated levels of carbon dioxide (pH-8.1), which is basic (or alkaline), but as the ocean consumes more CO2, the pH drops and the ocean becomes more acidic. (National Oceanic and Atmospheric Administration, April 2020)[31].

Seawater's significant buffering action often prevents large pH changes in coastal waters[32]. When the pH rises, the sea becomes basic, and when the pH falls, the sea becomes acid. I looked at the pH of four different samples and found that they were all acidic. The pH of inland water bodies is influenced by changes in dissolved oxygen content and CO2[33]. The temperature of the sea surface is a critical characteristic in the upper ocean because it controls biological activity, gas, heat, and momentum exchange with the atmosphere[34]. The average temperature of the ocean surface waters is around 17 degrees Celsius (62.6 degrees Fahrenheit), according to Windows to the Universe[35]. Water temperature affects the chemical processes of dissolution-precipitation, adsorption-desorption, oxidation-reduction, and the physiology of the biotic population in an aquatic habitat[36]. The temperature of the water affects all chemical reactions as well as fish growth, reproduction, and immunity.

Temperature variability, can cause changes in marine and estuarine ecosystems at all levels of the food chain, from primary productivity to top predators, including fisheries[37]. Tropical aquatic organisms such as shell and fin fishes thrive in water temperatures between 25 and 30 degrees Fahrenheit[38]. During a specific season, I saw high temperatures in my research sites. It's possible that global warming is at blame. As a result of the high temperatures, fish in my study sites may be injured. The capacity of water to carry electricity is measured by its electrical conductivity. The EC is connected to the ion concentration in the water (Electrical Conductivity). Dissolved salts and inorganic elements such as alkalis, chlorides, sulphides, and carbonate compounds provide these conductive ions. The conductivity of sea water increases as more ions are present. Water conductivity was found to be lower in my sample sites. The TDS (Total Dissolved Solids) values in the water samples are high. High TDS levels may be responsible for the bitter, salty, brackish flavour of seawater. Four samples had nearly the same level of Total Dissolved Solid (TDS) at my research locations, however MW 3 and MW 4 had higher levels than MW 1 and MW 2.

TDS contains two essential minerals, calcium and magnesium, which contribute to staining, scale formation, and water hardness. Indicated that pollutants from ships or transferred from land, organic matters, microscopic microbes, planktons, inorganic matters, or even sediment are among the materials that create turbidity in water[39,40]. The sea waters get turbid as the degree of cloudiness and haziness grows. Turbidity of sea waters was discovered in my research sites, revealing a high level of turbidity. Only MW 2 is able to detect the odor.

Chemical parameters were examined for four different seawater regions. Total hardness, calcium hardness, magnesium hardness, nitrate, potassium, sodium, sulphate, chloride, dissolved oxygen, free carbon dioxide, nitrogen, phosphorus, BOD (biochemical oxygen demand), and COD (chemical oxygen demand). Total hardness is a term used to characterise the impact of dissolved minerals in

water bodies[41]. The Total hardness of MW 1 is higher than the other three samples in my research. In natural surface and bottom water, the most abundant main cations are calcium and magnesium[42]. In my current investigation, the calcium and magnesium hardness of all four samples increased. Calcium and Magnesium levels were high in Sampling Site 2 (MW2-Hare Island, Tuticorin) when compared to the other three samples. This could be due to waste discharge from the Thermal Power Station, which is located near the MW 2 site.

The amounts of nutrients in riverine and coastal water sources, as well as the qualities of each nutrient in the mixture, influence the nutritional content of the marine ecosystem[43]. Nutrient and other pollutant discharges to coastal waters have increased significantly since pre-industrial times, owing to increased human activity in the surrounding watershed[44]. In the nitrate test, the first three samples have the same quantity of nitrates. In comparison to the other three samples, the fourth sample contains the least quantity of nitrate. The dissolved nutrients are essential components for primary production, and nitrate and phosphate boost primary productivity. Both are required for autotrophy to survive, but they are only found in trace amounts in water[45].

Concentrations of dissolved oxygen (DO) in water and available to aquatic creatures, one of the most important markers of a water body's quality, are stressful and potentially deadly to many fish and other species[44]. There is a significant risk of fish and other marine species being injured in my research regions because all of the samples have dissolved oxygen levels below 5 mg/L. Temperature, salinity, wave action, the number of plankton present, pollution, and the impact of incorporating external water masses all influence dissolved oxygen levels in the saltwater column[45]. The ability of aquatic ecosystems to support the life and growth of aquatic species is known to be determined by dissolved oxygen levels. Dissolved oxygen values greater than 3.5 ml/l were always associated with abundant fish populations and species variety[46]. In the Gulf of Mannar, recorded 4.5 to 4.6ml/l in Hare island in the Mandapam group of islands[47].

Elevated dissolved CO2 concentrations in the water activate the primary stress response in fish, causing significant physiological disturbances that can result in reduced growth, poor feed conversion, nephrocalcinosis, or hypercalcinosis[48-52]. In MW 3 and MW 4, the maximum amount of free CO2 is found. In MW 1 and MW 2, the minimum content of free CO2 was recorded. In all four samples, the highest potassium concentration was found. Throughout the investigation, sodium was shown to have lower values than potassium.

Sulphate concentrations were highest in all four locations. The values of chloride were found to be lower than those of sulphate. In comparison to the other three samples, MW 1 contains a significant amount of chloride. The degradation of organic matter is causing an increase in nitrogen content[53]. The same amount of nitrogen was found in all four samples. MW 2 and MW 3 have the same amount of phosphorus in my current research. In MW 1 and MW 4, the highest levels of phosphorus were found. In comparison to the other three samples, MW 4 has a high level of demand for BOD (biochemical oxygen demand) and COD (chemical oxygen demand).

The BOD activity is more important in measuring the organic pollution of aquatic ecosystems throughout the summer[54]. In my investigation, the highest levels of BOD were detected in MW 1 and MW 4 during the post-monsoon season. BOD is the amount of oxygen used by microbial organisms to breakdown organic molecules in water[55]. The BOD test is used to determine how contaminated a wastewater is as well as the efficacy of effluent treatment technology. The amount of BOD in water has a big impact on DO. The greater the oxygen depletion in water bodies, the higher the BOD concentration. As a result, the amount of oxygen available to higher kinds of aquatic life decreases, resulting in the demise of aquatic organisms. The BOD monitoring of seawater in this investigation revealed very low values that did not exceed the limits set by the Environmental Standards (100 mg/L)[56]. Chemical Oxygen Demand is defined as the oxygen equivalent of the organic content of a sample that is vulnerable to oxidation by a powerful chemicaloxidant[57]. It's a method of determining how much organic stuff has contaminated water.

Higher COD levels imply a higher load of organic and inorganic pollutants, which requires more oxygen to oxidise under higher temperatures[58,54]. MW 4 had the highest COD concentration. BOD has lower levels than COD on average. Because some organic compounds in the water that are resistant to microbial oxidation and hence not included in BOD can be chemically oxidised, the COD value is frequently larger than the BOD. COD measurements take a few hours, whereas BOD measurements take about five days (BOD5)[59]. The COD monitoring of seawater in this investigation revealed very low values that did not violate the Environmental Standards (250mg/L). BOD and COD are frequently used to estimate the amount of organic contamination in water and waste water[60].

Table No.1: (Lat. Long of Each Study Site)[25]

S.No	Study Sites	Latitude	Longitude
1	Periyathalai	8°20'12.81"N	77°58'20.77"E
2	Hare Island	8°46'25.15"N	78°11'16.05"E
3	New Harbour	8°46'2.82"N	78°11'49.42"E
4	Mandapam	9°16'41.92"N	79°7'32.62"E

Table No.2: Methods of analysis of physico-chemical parameters

S.No	Parameter	Methods of analysis
1	pH	pH-meter
2	Temperature	Thermometers
3	Turbidity	Turbidity meter
4	Electrical Conductivity	Conductivity meter
5	TDS	TDS meter
6	Total hardness, Calcium Hardness	Complexometry
7	Nitrate	Colorimetry
8	DissolvedO_2	Titrimetry (Winkler's Method)
9	Potassium	Colorimetry
10	Sodium	Colorimetry
11	Sulphate	Turbidometry
12	Chloride	Argentometry
13	Free CO2	Titrimetry
14	Nitrogen	Doctor-N Capsule
15	Phosphorus	Doctor-P Capsule
16	BOD (Biochemical Oxygen Demand)	5-Day BOD Test
17	COD (Chemical Oxygen Demand)	Closed Reflux, Colorimetric Method

Table No.3: Physical Parameters of Sea Water

S.No	Physical Parameters of Sea Water	Sample 1 Periyathalai MW 1	Sample 2 Hare Island MW 2	Sample 3 New harbour MW 3	Sample 4 Mandapam MW 4
1	pH	7.35	7.2	7.55	7.4
2	Temperature (^{O}C)	29.2^{O}C	28.85^{O}C	29.1^{O}C	29.05^{O}C
3	Electrical Conductivity (dS/m)	3276.5	3284	3315.5	3357.5
4	Total Dissolved Solids (TDS)	3276.5	3284	3324	3320.5
5	Turbidity	109%	112%	112%	111%
6	Odour	-----	Odour	-----	------
7	Color	Colourless	Colourless	Colourless	Colourless

(MW represents Marine Water; MW1-Periyathalai, MW2-Hare Island, MW3-New Harbour, MW4-Mandapam)

Table No.4: Chemical Parameters of Sea Water

S.No	Chemical Parameters of Sea Water	Sample 1 Periyathalai Mg/L MW 1	Sample 2 Hare Island Mg/L MW 2	Sample 3 New Harbour Mg/L MW 3	Sample 4 Mandapam Mg/L MW 4
1	Total Hardness	6.4	4.45	4.538	4.668
2	Calcium Hardness	420.525	560.1393	468.46485	420.525
3	Magnesium Hardness	414.125	555.6893	463.92685	415.857
4	Nitrate Test	180	180	180	160
5	Dissolved Oxygen	0.002	0.001	0.0012	0.0014
6	Free CO2	25	35	65	50
7	Potassium Test	3.371	9.0857	5.2	6.22857
8	Sodium Test	2.13	8.8	2.13	2.13
9	Sulphate Test	9.0558	9.293	8.58076	9.0236686
10	Chloride Test	3.2825	0.132935	0.0868525	0.0974875
11	Nitrogen	0.40	0.40	0.40	0.40
12	Phosphorus	0.25	0.50	0.50	0.15
13	BOD	10.55	8.45	9.50	10.65
14	COD	12.55	10.60	12.61	16.80

(MW represents Marine Water; MW1-Periyathalai, MW2-Hare Island, MW3-New Harbour, MW4-Mandapam)

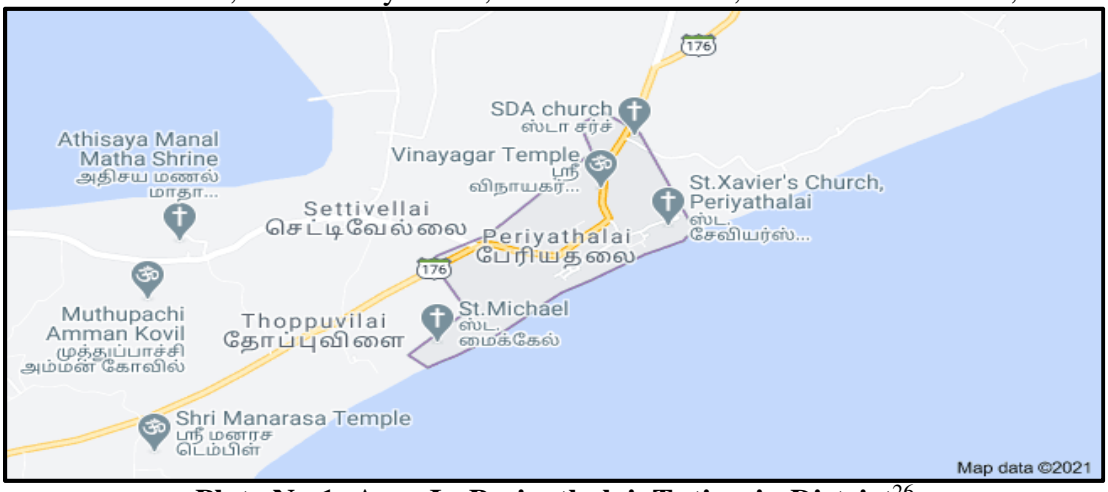

Plate No.1: Area I - Periyathalai, Tuticorin District[26]

Plate No.2: Area II - Hare Island, Tuticorin District[27]

Plate No.3: Area III - New Harbour, Tuticorin District[28]

Plate No.4: Area IV - Mandapam, Rameswaram district[29]

Study Site I – Periyathalai Study

Site II - Hare Island

Study Site III - New Harbour Study

Site IV- Mandapam, Rameswaram

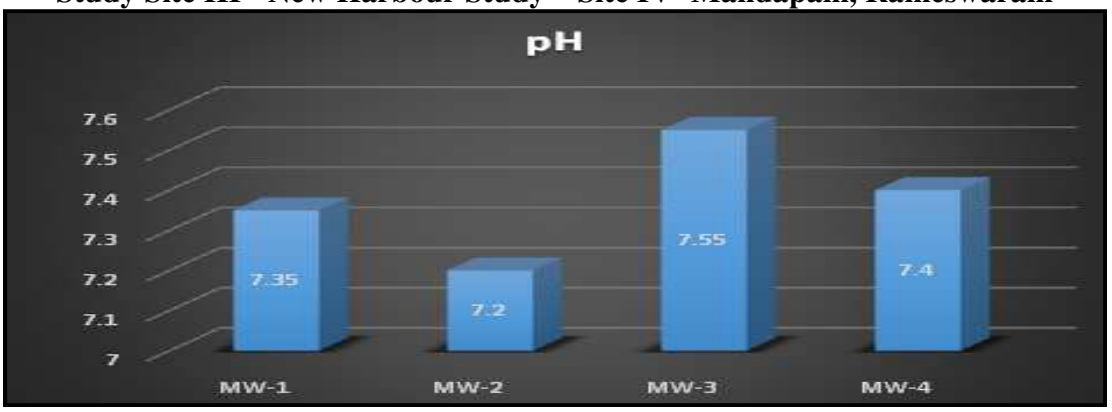

Figure No.1: pH of all the four samples

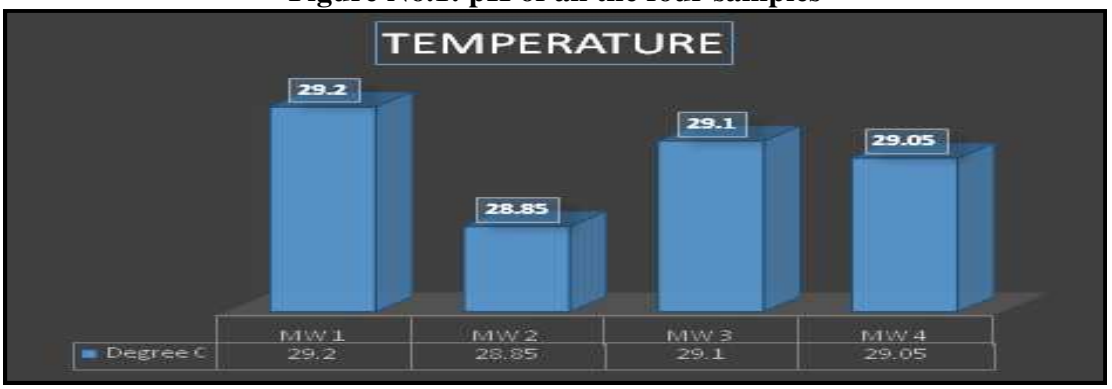

Figure No.2: Temperature of all the four samples

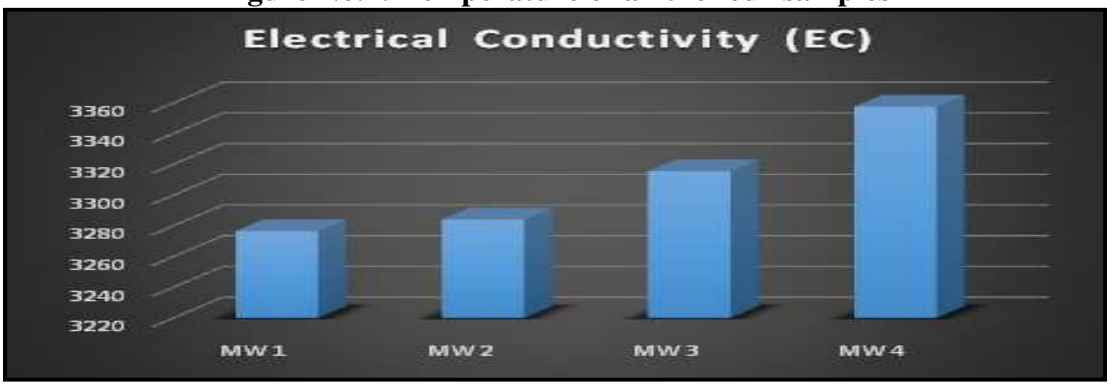

Figure No.3: EC (Electrical Conductivity) of all the four samples

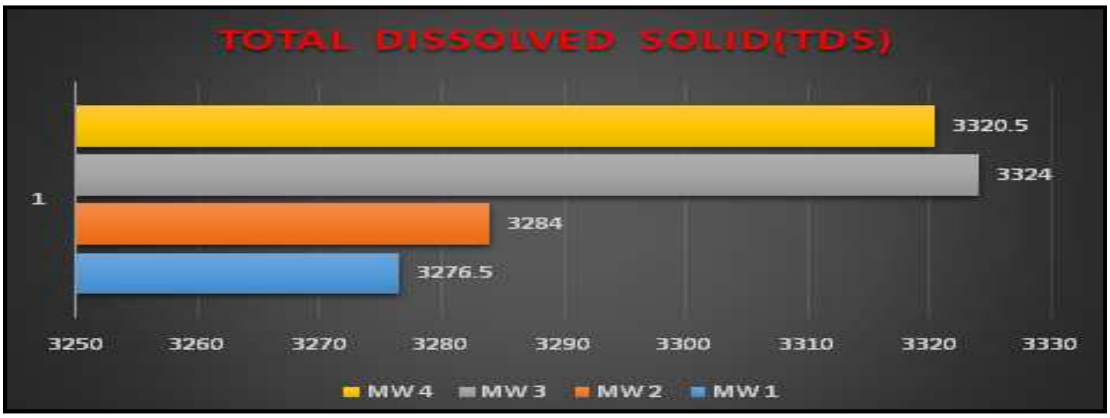

Figure No.4: TDS (Total Dissolved Solids) of all the four samples

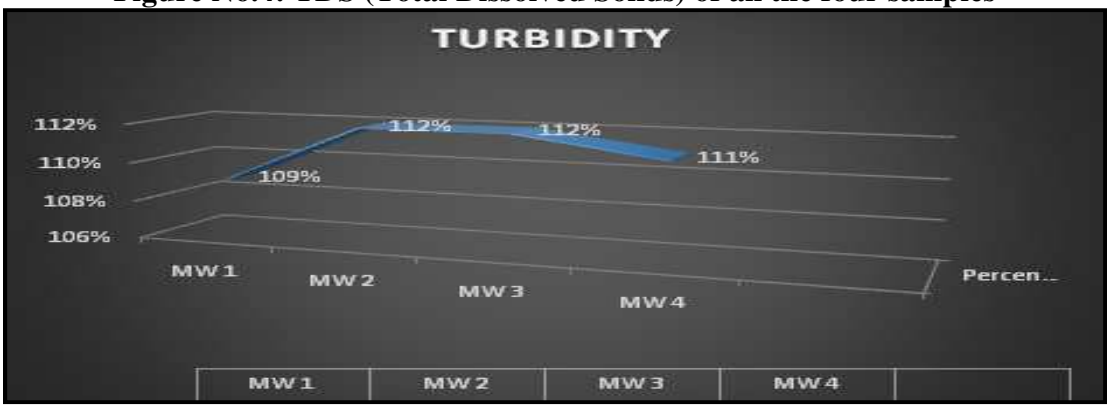

Figure No.5: Turbidity of all the four samples

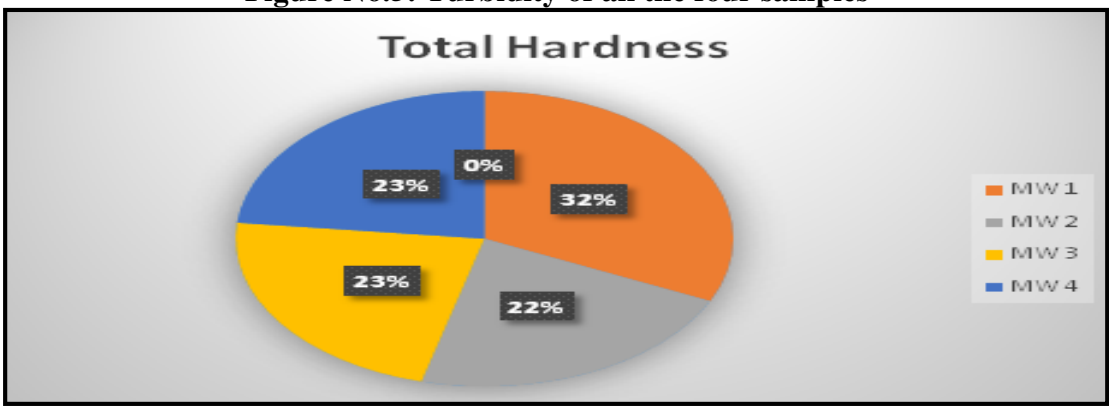

Figure No.6: Hardness of all the four samples

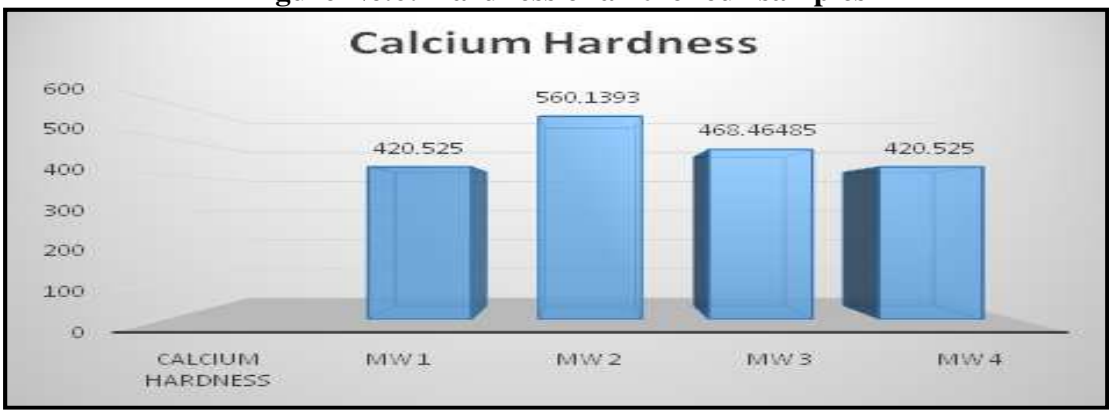

Figure No.7: Overall Calcium Hardness of all the four samples

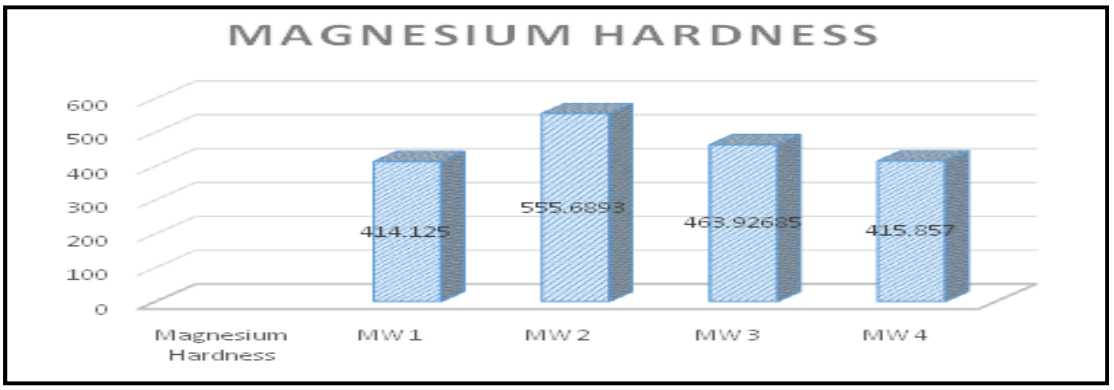

Figure No.8: Overall Magnesium of all the four samples

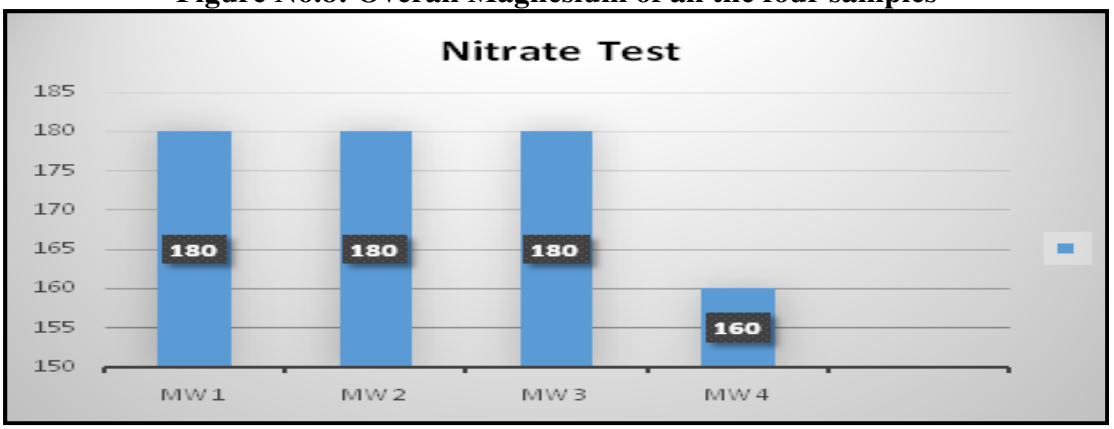

Figure No.9: Overall Nitrate of all the four samples

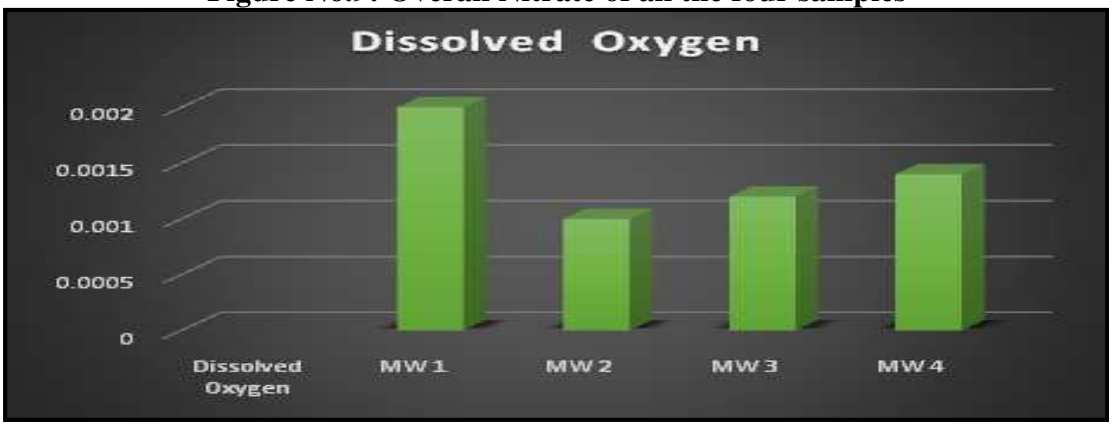

Figure No.10: Overall Dissolved Oxygen of all the four samples

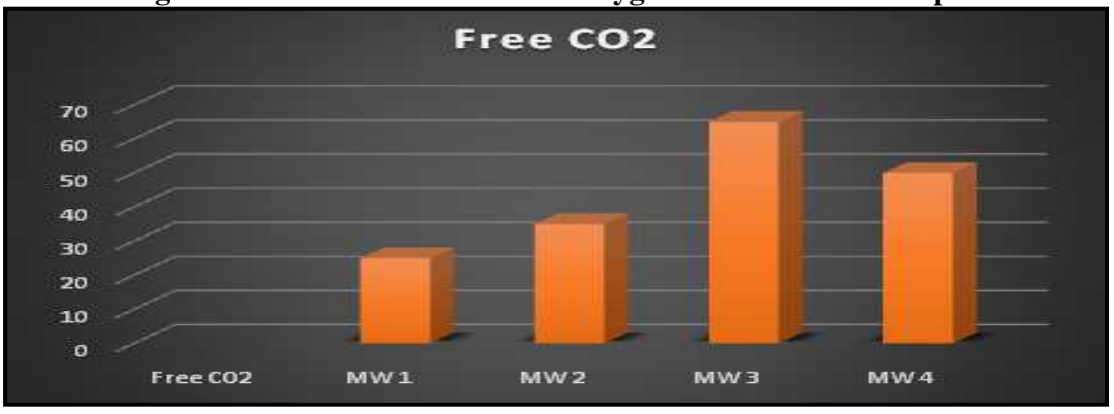

Figure No.11: Overall Free CO2 of all the four samples

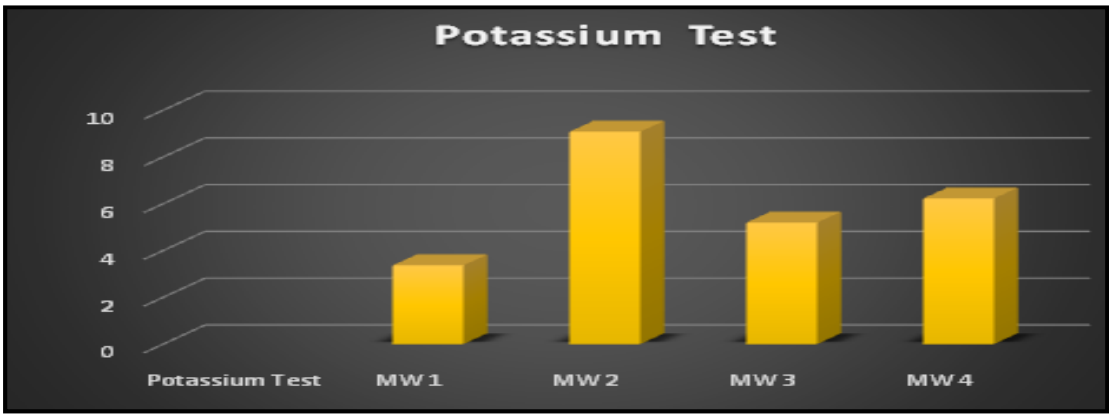

Figure No.12: Overall Potassium of all the four samples

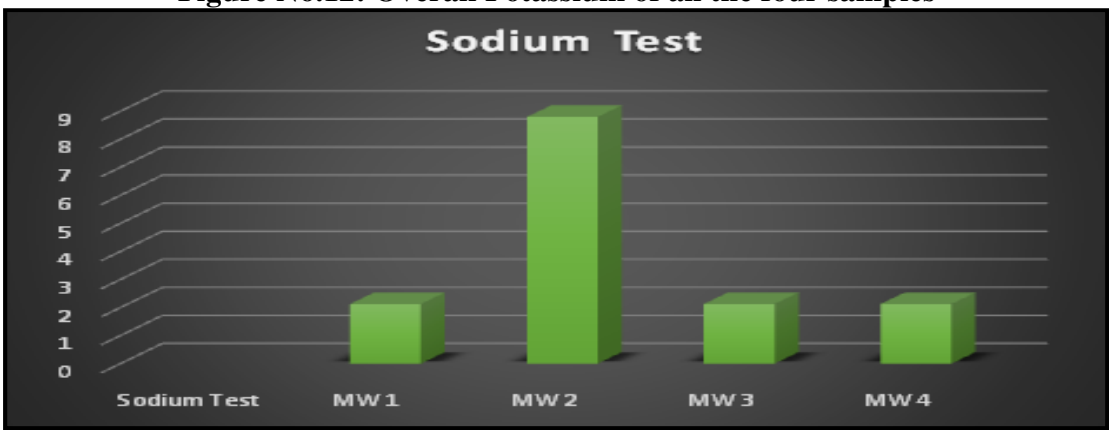

Figure No.13: Overall Sodium of all the four samples

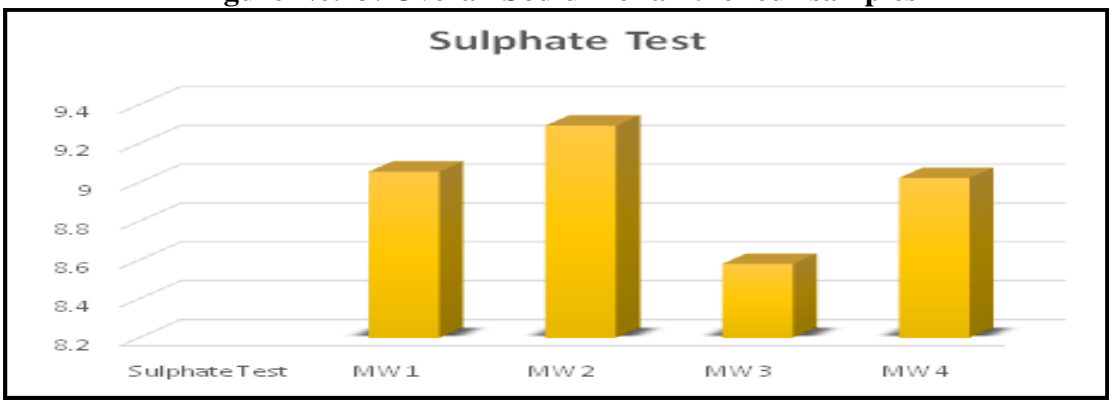

Figure No.14: Overall Sulphate of all the four samples

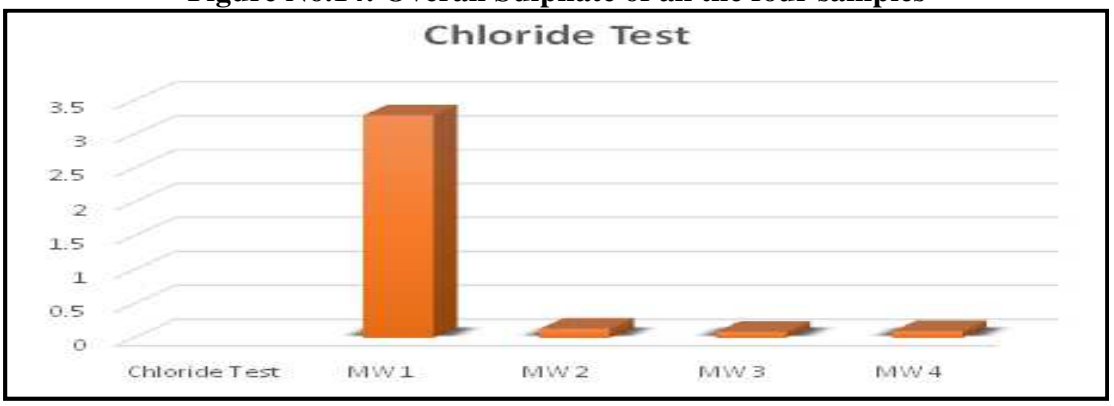

Figure No.15: Overall Chloride of all the four samples

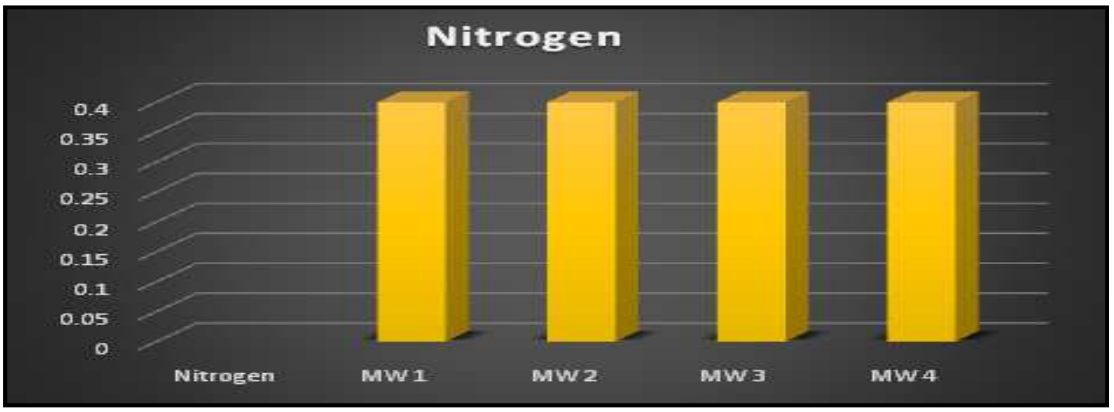

Figure No.16: Overall Nitrogen of all the four samples

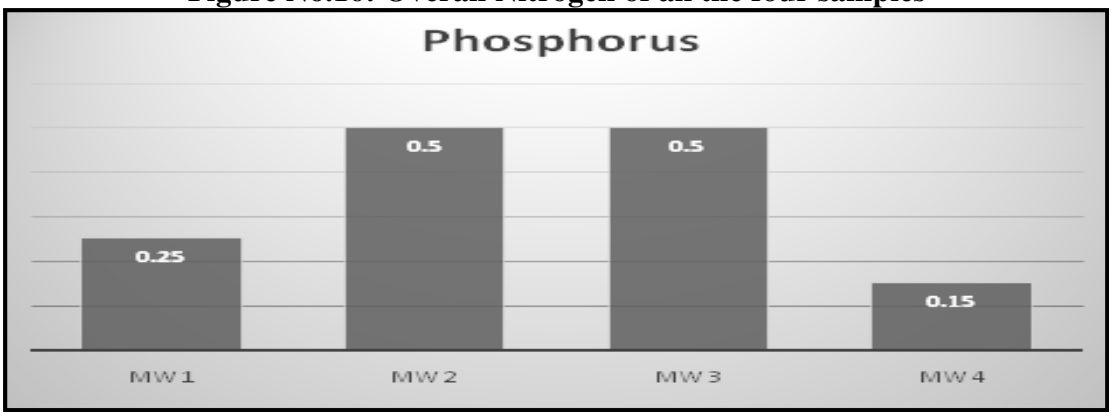

Figure No.17: Overall Phosphorus of all the four samples

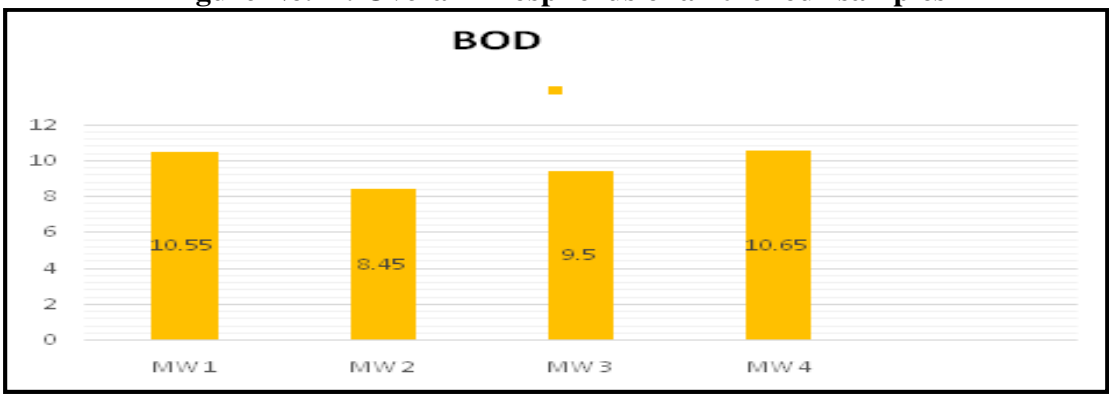

Figure No.18: Overall BOD of all the four samples

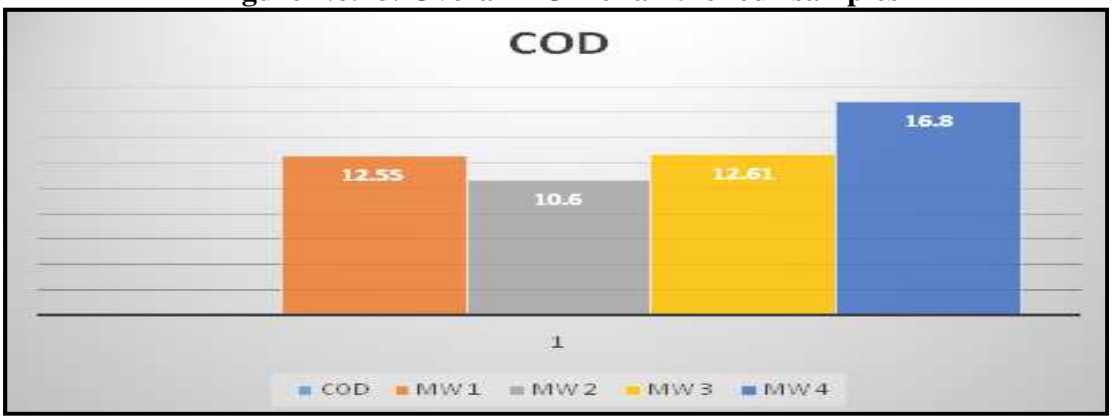

Figure No.19: Overall COD of all the four samples

CONCLUSION

Physicochemical parameters in seawaters of Tuticorin and Rameswaram districts were investigated during the post-monsoon season, from October to December 2019. Physical and chemical factors were examined in four different locations of sea water. This research reveals that Calcium and magnesium hardness, as well as dissolved oxygen, potassium, sodium and sulphate levels, are at their highest in Sampling Site 2 (MW 2-Hare Island, Tuticorin). High dissolved mineral concentrations (Total Hardness) reported in Sample 1 (MW 1-Periyathalai, Tuticorin District) could result in fish death due to an overabundance of minerals in a specific site. High temperatures were recorded in all four places. High temperatures can alter the physiology of the biotic population in an aquatic habitat in all four locations. Throughout my investigation, territory had lower nitrogen fixation and a similar amount of nitrogen. According to the findings of this study, pollution had a considerable impact on sampling site 2 (MW 2-Hare Island, Tuticorin) during the Post Monsoon Season. This could occur as a result of waste discharge from the Thermal Power Station, which is close to the MW 2 site. So, Routine physico-chemical parameter study is necessary because it contributes to the extinction of marine species by altering the balance of parameters in aquatic ecosystems. This research could be used as a foundation for a project to track the quality of sea water in specific regions and to create specific strategies to safeguard marine life, based on the findings.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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