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CALCULATION OF WATER QUALITY INDEX AND PHYSICO-CHEMICAL ANALYSIS OF PRAVARA RIVER WATER AHMEDNAGAR DISTRICT (MAHARASHTRA)

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ABSTRACT

Water is a natural resource, human life is impossible without water. Water is used by humans for various purposes, but various overuses by humans are causing water scarcity. The most important reason behind this is the increasing population and the increasing consumption of water, which is being released into rivers, streams, lakes, seas, oceans, causing a large amount of water pollution. The present investigations of the comparative study of Calculation of Water Quality Index and Physico-chemical Analysis of Pravara River water in Ahmednagar district of Maharashtra. The samples were collected in sterilized polythene bottles of one litter capacity monitoring were done during January 2023 and November 2023. There are 12 Physico- chemical parameters having test observed in four sampling sites along the course of Pravara River. The streams from catchments area Wilson dam, Nilwande , Kalas and Ashwi . Water samples were collected during morning hours. Physico-chemical parameters include , pH and chemical parameters are tested Conductivity, Calcium, Magnesium, Sodium, Palash, Carbonate, Bio -carbonate, Chloride, Sulfate, Sodium Stable Ratio, Residual Sodium Carbone. Calculations of water quality index and physico-chemical analysis of water have been done during pre-monsoon and post-monsoon periods

Keywords: Physical and Chemical Characteristic, Pravara River, Water Analysis, Resources

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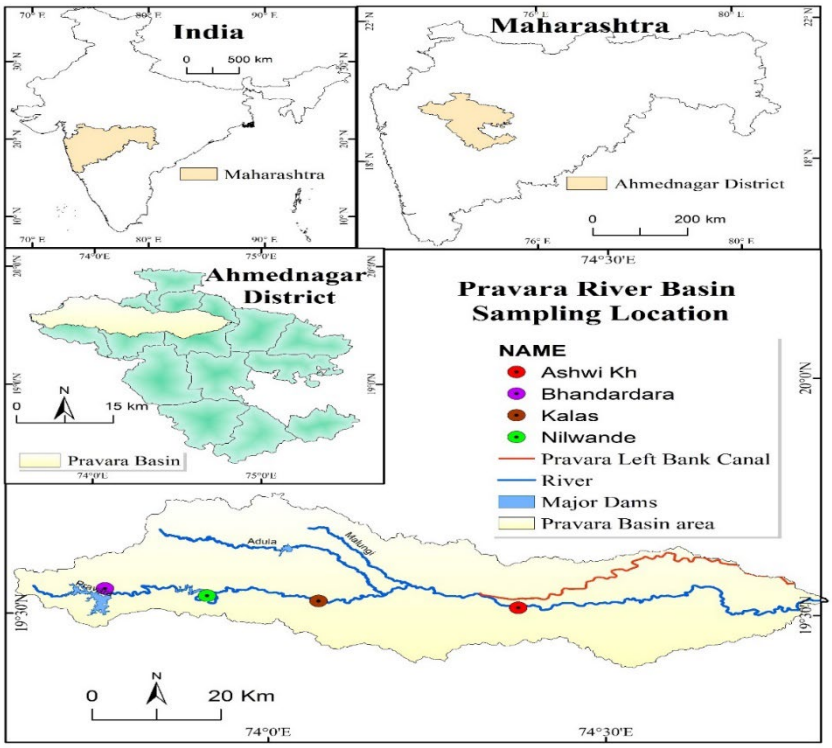
1. INTRODUCTION

Water is a natural resource and is naturally regenerated. Humans are using this water for various purposes. Human potable water is very scarce. At the same time, due to increasing pollution, these water shortages are occurring. Humans need good water for drinking and use in terms of health. From one point of view, the consumption of water is increasing due to the increasing population. At the same time, water pollution is increasing due to various processes like industrialization, urbanization, Chemical farming. Humans are releasing impure/polluted water into rivers, streams, lakes, streams, oceans. There are many sources of drinking water, mainly river, lakes, wells and dams. Humans should have access to potable water, but in modern times large quantities of drinking water are being polluted, mainly due to industrial water conditions. The water is being polluted by chemical fertilizers and pesticides produced from agriculture. It requires water analysis and water testing as well as the study of water parameters [30,31]. Man uses water for various

purposes, mainly for drinking water, for industry, agriculture and various reasons. As the population grows, so does the



use of water, which is causing massive pollution. Humans are responsible for water pollution [27,28]. Human socio-economic status depends on water In short, human economic development and social development depends on the availability of water. Where water is available, human existence and population density is high and economic development is high [23,24,25]. Water pollution is on the rise due to various human economic activities. Drinking-water is consumed not only as water per se but also in beverages and incorporated into foodstuffs. In response to increasing global and local water scarcity, there is increasing use of sources such as recovered or recycled waters, harvested rainwater and desalinated waters. The quality of water is of main role for man since it is directly linked to human health [2]. The quality of water varies widely with respect to its various uses and the water quality suitable for one purpose may not satisfactory for another. Topography affects the river system as well as the nature of the river depending on the geological structure and rainfall [3,4]. The present investigations of the comparative study of physico chemical parameters of Pravara river water in Ahmednagar district of Maharashtra. Samples were collected in the month of January 2023 and November 2023. Water samples are taken during pre-monsoon and post-monsoon periods. Physical and chemical parameters the result indicates that there is marked variation in physico chemical parameters of that dam water and sites of Pravara River.

2. STUDY AREA

The Pravara rises on the eastern slopes of the Sahayadris between Kulang and Ratangad mountains in the Ahmednagar District of Maharashtra. The Pravara River is the smallest of the major tributaries river of Godavari . Among the 7 major tributaries, it is the only tributary which originates in the Western Ghats akin to Godavari. Also, it is the only major tributary of Godavari to have both its source and confluence located within the same district - Ahmednagar. There are 12 Physico- chemical parameters having test. Four sampling sites along the course of Pravara River were selected for the study viz. Streams from catchments area Wilson dam, Nilwande, Kalas and Ashwi Map no and Table no 01.

Map no 01: Location map and Sampling map

AIMS AND OBJECT

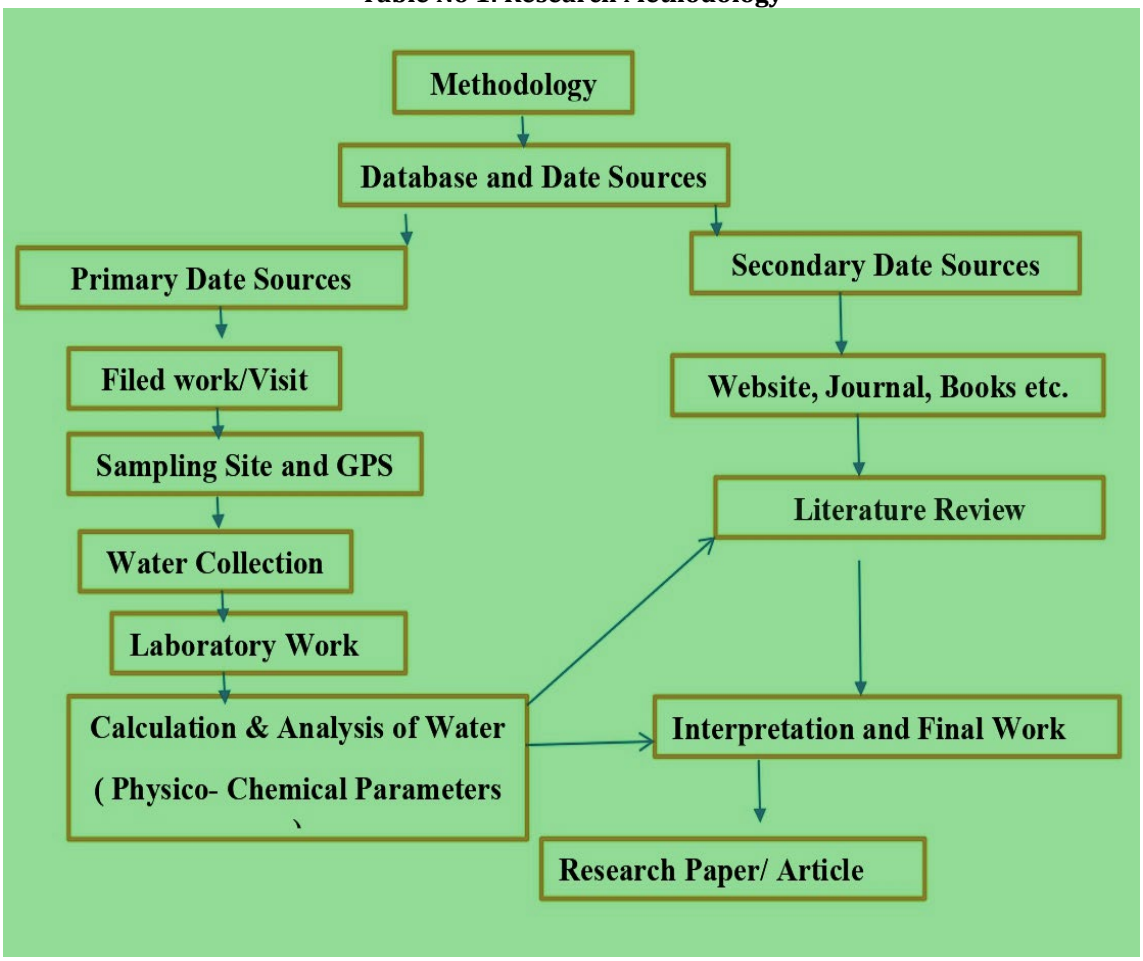
The main objective of this study is to study the Calculation of Water Quality Index and Physico-chemical Analysis of water in the four places of Bhandardara, Nilwande, Kalas and Ashwi in the field pH, Conductivity, Calcium, Magnesium, Sodium, Palash, Carbonate, Bio carbonate, Chloride, Sulfate, Sodium Stable ratio, Residual Sodium Carbone etc., these all

components of the water here have been studied during January 2023 and November 2023 months. Water samples are taken during pre-monsoon and post-monsoon periods.

3. METHODOLOGY

Calculations of water quality index and physico-chemical analysis of water have been done during pre-monsoon and post-monsoon periods .There are four different sites were selected for collection of samples in Pravara River. Collection and analysis of water samples were done at day interval, during the period of two days. The samples were collected in sterilized polythene bottles of one litter capacity monitoring were done during January 2023 and November 2023 months. Water samples are taken during pre-monsoon and post-monsoon periods. Samples were analysis of physico chemical parameters in laboratory (Krusi Vidnyan Kendra, Babhaleshwar). There are 12 Physico- chemical parameters having test. Four sampling sites along the course of Pravara River were selected for the study viz. Streams from catchments area Wilson dam, Nilwande, Kalas and Ashwi .Water samples were collected during morning hours. The chemical parameters of the samples were analyzed. Physical parameters include , pH and chemical parameters are tested Conductivity, Calcium, Magnesium, Sodium, Palash, Carbonate, Bio -carbonate, Chloride, Sulfate, Sodium Stable Ratio, Residual Sodium Carbone. GPS is considered to be the most important method for fieldwork so that you can get the locations of the perfect places [8,17,20] . So in this research GPS is used to find and remark the sampling side. Calculations of water quality index and physico-chemical analysis of water have been done during pre-monsoon and post-monsoon periods. The complete research methodology is shown in table no 01.

Table No 1: Research Methodology



Source Design by Researchers

4. RESULT AND ANALYSES

Water is supplied locally through various schemes so that human beings have the first duty to get clean water. Although the source of water is rain, it is available to human beings in many ways, mainly through various means such as rivers, streams, lakes, well, tube well. Humans use water for a variety of purposes, mainly for domestic use, for industrial

purposes, and for agriculture and other businesses. Although water is a natural resource, human beings are a resource. Human resources are causing a lot of pollution, mainly water pollution in modern times, air pollution, noise pollution, waste pollution. Water quality is manipulated by human as well as natural and various factories, mainly polluted water coming out of agriculture, large amount of contaminated water is obtained from factories and domestic use, which degrades water quality.

Rain is the main source of drinking water or rain is the source of water availability [7]. In addition to the growth of plants depends on the growth of plants depends on the water or on the water availability is much higher density of plants there is water where there is a shortage of water, whereas low density of plants will be in this place [4]. We are selecting four site of Pravara River in Ahmednagar district for the case study of water content analysis. The especially we selected these four village near the bank of Pravara river. For this purpose we selected purposive random sampling survey method and collected the water sample of the Pravara River from namely in Bhandardara, Nilwande, Kalas and Ashwi sites respectively. Calculations of water quality index and physico-chemical analysis of water have been done during pre-monsoon and post-monsoon periods.

Table No 02: Water Analyses with Sample Sites (Pre – monsoon) January 2023

Sr. No	Elements	Pre- monsoon Sampling Sites				Scale
		Bhandardara	Nilwande	Kalas	Ashwi	
1	pH	6.5	7.4	7.8	8.9	6.50-7.50
2	Conductivity	0.5	0.36	0.60	0.87	0.00-0.25
3	Calcium	0.8	1.01	1.7	3.7	0.00-1.50
4	Magnesium	2.5	3.8	4.1	4.4	0.00-5.00
5	Sodium	1.2	2.6	2.9	4.8	0.00-4.00
6	Palash	0	0	0.05	0.06	0.00-0.00
7	Carbonate	0	0	0	0	0.00-1.50
8	Bio carbonate	4.9	5.8	6.9	7.7	0.00-1.50
9	Chloride	5.5	5.9	6.9	7.8	0.00-2.00
10	Sulfate	0.9	1.4	1.1	1.6	0.00-2.00
11	Sodium Stable Ratio	1.0157	1.5492	2.5504	3.7	0.00-10.00
12	Water Classification	Medium	Medium	Medium	Medium	-
13	Residual Sodium Carbone	1	0.8	1.2	1.5	0.00-1.25

In table number 02 and 03, the values of the chemical properties of Pravara river water are given. This shows that there is variation in various water constituents between pre-monsoon and post-monsoon. Among the 13 unanalyzed contents of the water, the most promising pH and chemical parameters are tested Conductivity, Calcium, Magnesium, Sodium, Palash, Carbonate, Bio-carbonate, Chloride, Sulfate, Sodium Stable Ratio, Residual Sodium Carbone are the most vlaue. The main reason for this is that polluted water is released into this river from Sangamner and its surrounding areas. All this water comes to the dams on the river at Ashvi, in these dams water is used for various activities for Ashvi and it is stored here.

Table No 03: Water Analyses with Sample Sites (Post – monsoon) November, 2023

Sr. No	Elements	Post - monsoon Sampling Sites Sampling Sites				Scale
		Bhandardara	Nilwande	Kalas	Ashwi	
1	pH	7.28	7.62	7.8	8.18	6.50-7.50
2	Conductivity	0.43	0.51	0.6	0.87	0.00-0.25
3	Calcium	0.8	1.9	1.4	3.6	0.00-1.50
4	Magnesium	3	3.6	3.8	4.4	0.00-5.00
5	Sodium	1.4	2.4	2.5	4.4	0.00-4.00
6	Palash	0	0	0.05	0.05	0.00-0.00
7	Carbonate	0	0	0	0	0.00-1.50
8	Bio carbonate	4.8	5.6	6.4	7.2	0.00-1.50
9	Chloride	5.2	6	6.8	7.6	0.00-2.00
10	Sulfate	1	1.2	1.5	1.7	0.00-2.00
11	Sodium Stable Ratio	1.0157	1.5492	1.5504	2.2	0.00-10.00
12	Water Classification	Medium	Medium	Medium	Low	-
13	Residual Sodium Carbone	1	0.8	1.2	1.9	0.00-1.25

If we think about the post monsoon period, all the elements of Pravara river water (pH and chemical parameters are tested Conductivity, Calcium, Magnesium, Sodium, Palash, Carbonate, Bio-carbonate, Chloride, Sulfate, Sodium Stable

Ratio, Residual Sodium Carbone.) More are seen in this Ashwi place. Even during this time, you can see the most polluted water in Ashvi. The important reasons for this are as above. In short, the polluted water from Akole, Sangamner goes into the river and all this water accumulates in Ashvi. Due to this, there is no potable water here in short the water in the Ashvi area is heavily polluted.

Table No. 04 shows the statistical summary of the study on chemical constituents of Prawara river water. It mainly shows the maximum, minimum, mean and standard division value of each parameter during pre-monsoon and post-monsoon periods.

Four locations were selected to study the chemical properties of water in Prawara River, the maximum values of the elements in these locations are as follows. pH (8.9), Conductivity (0.87) Calcium(3.7), Magnesium (4.4), Sodium(4.8), Palash (0.06),Bio-carbonate(7.7) , Chloride (7.8), Sulfate (1.6), Sodium Stable Ratio(3.7), Residual Sodium Carbone (1.5).

Table No 04: Statistical Summary of Physico-Chemical Parameters

	Pre-monsoon				**Post-monsoon**			
Parameters	Max.	Min.	Mean	SD	Max.	Min.	Mean	SD
pH	8.9	6.50	7.65	0.99	8.18	7.28	7.72	0.37
Conductivity	0.87	0.36	0.58	0.22	0.87	0.43	0.60	0.19
Calcium	3.7	0.80	1.80	1.32	3.6	0.80	1.93	1.20
Magnesium	4.4	2.50	3.70	0.84	4.4	3.00	3.70	0.58
Sodium	4.8	1.20	2.88	1.48	4.4	1.40	2.68	1.25
Palash	0.06	0.00	0.03	0.03	0.05	0.00	0.03	0.03
Carbonate	0	0.00	0.00	0.00	0	0.00	0.00	0.00
Bio carbonate	7.7	4.90	6.33	1.23	7.2	4.80	6.00	1.03
Chloride	7.8	5.50	6.53	1.03	7.6	5.20	6.40	1.03
Sulfate	1.6	0.90	1.25	0.31	1.7	1.00	1.35	0.31
Sodium Stable Ratio	3.7	1.02	2.20	1.18	2.2	1.02	1.58	0.48
Residual Sodium Carbone	1.5	0.80	1.13	0.30	1.9	0.8	0.75	0.53

Pre-monsoon has the highest pH between pre-monsoon and post-monsoon in the study area. Minimum pH is observed in post monsoon. Each chemical element is higher in pre-monsoon conditions and lower values are observed in post-monsoon period. This indicates that the chemical values are lower during the post monsoon period due to the fresh inflow of water into the river. Also the standard division values are higher in the pre monsoon period. At the same time, the standard divisional is lower for each component during the post-monsoon period. Also, the average value of each chemical element has been calculated. From this data it can be seen that the average prices during pre-monsoon are higher than post monsoon. This shows that there is no fresh water inflow during the pre-monsoon period during which contaminated water from the surrounding area of the study area is released into the river. Therefore, the values of various chemical elements here are seen to be increased. In short, during this period water pollution is seen to increase, this water is not useful for drinking and various purposes and it is dangerous for human health. The reverse situation occurs in the post-monsoon due to the inflow of fresh water into the river, so the values of chemical constituents of the water during this period are lower than the post-monsoon. Even so, it is evident that there is water pollution in both periods.

Fig No 01: Maximum Values of Physio Chemical Analysis of Pravara River Water

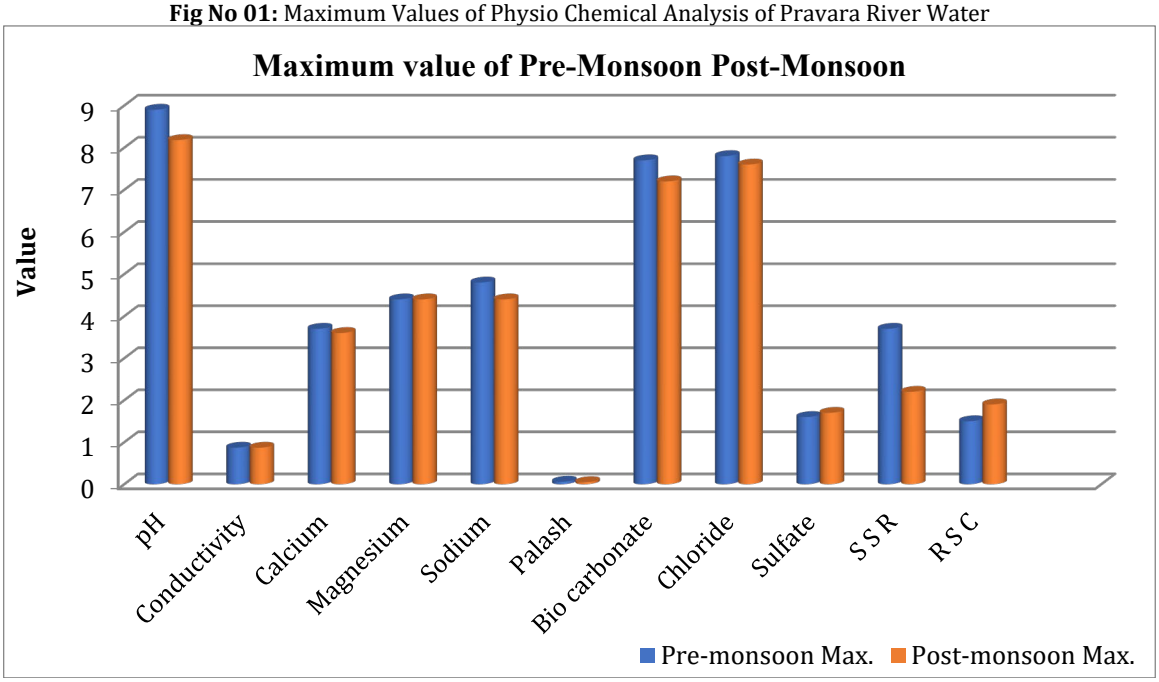


Fig No 02: SD Values of Physio Chemical Analysis of Pravara River Water

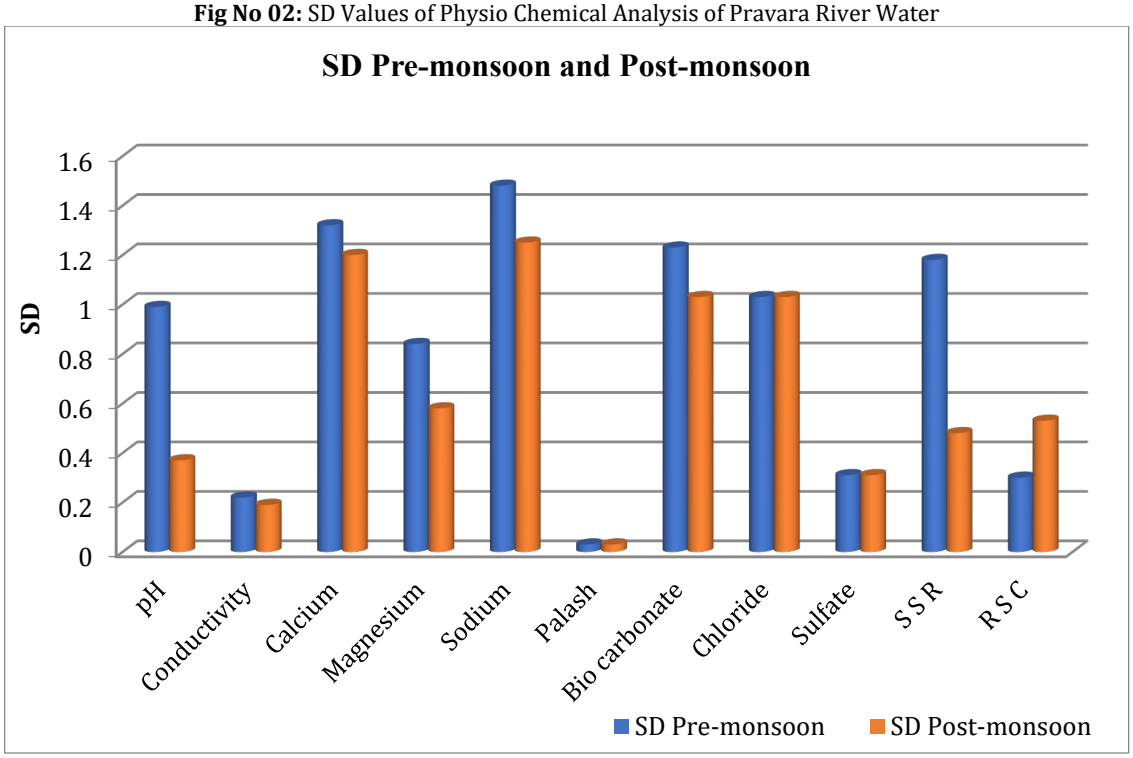
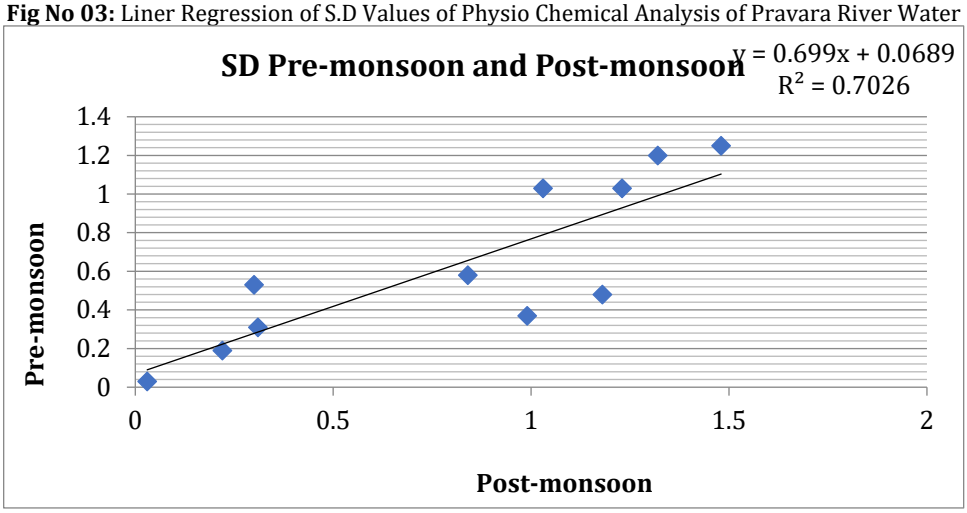


Fig No 03: Liner Regression of S.D Values of Physio Chemical Analysis of Pravara River Water



The value of R is 0.8382. : This is a strong positive correlation, which means that high X variable scores go with high Y variable scores (and vice versa).

5. PEARSON CORRELATION COEFFICIENT CALCULATOR

Fig No 04: Mean Values of Physio Chemical Analysis of Pravara River Water

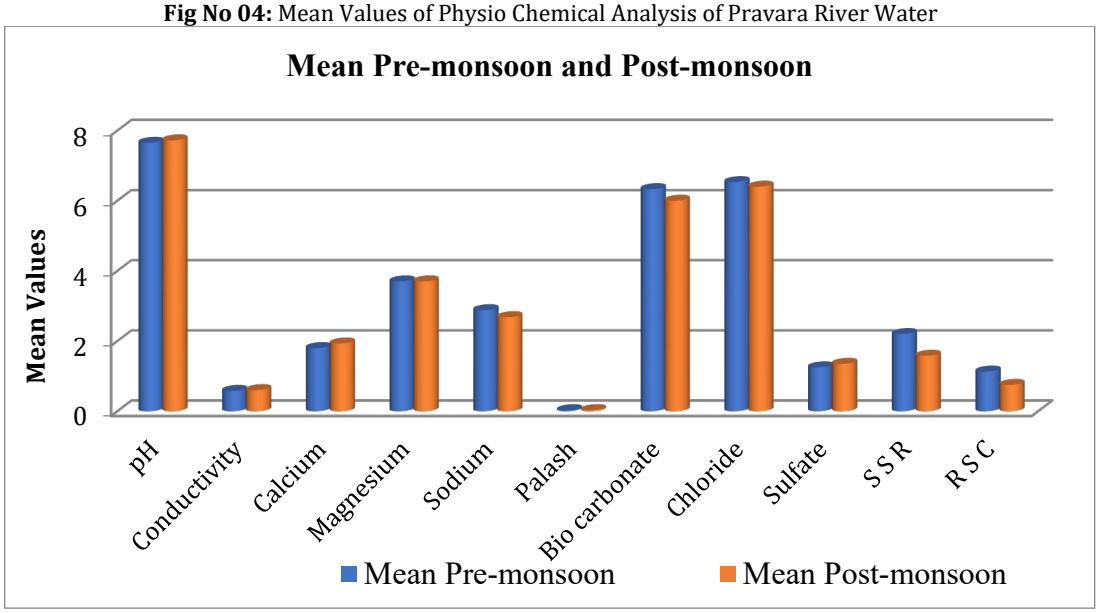
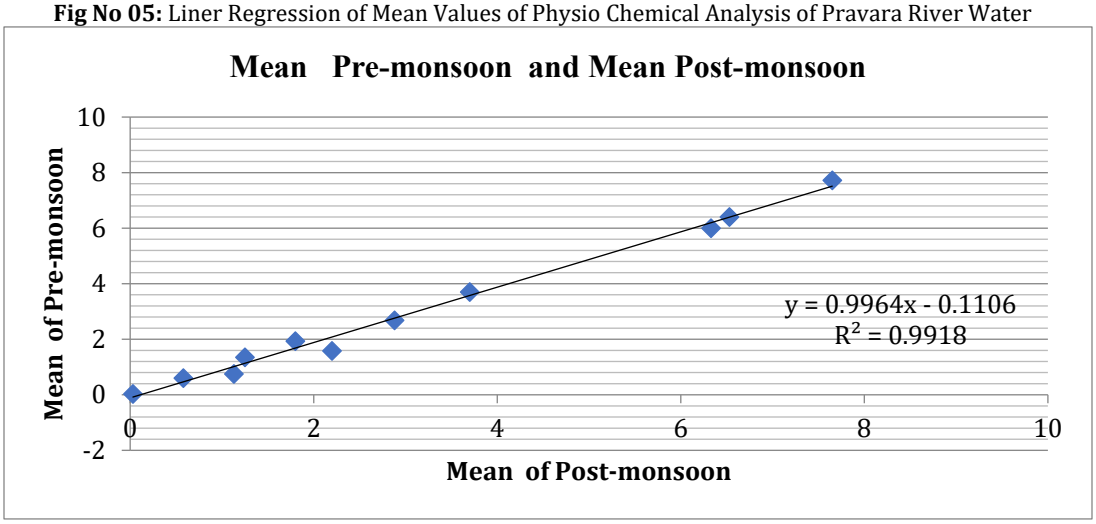


Fig No 05: Liner Regression of Mean Values of Physio Chemical Analysis of Pravara River Water



THE VALUE OF R IS 0.9959. : This is a strong positive correlation, which means that high X variable scores go with high Y variable scores (and vice versa).

The correlation of the chemical elements between pre-monsoon and post-monsoon periods has been studied with the help of linear regression with the help of Pearson Correlation Coefficient. Mainly the correlation which is studied is the comparative study between Standard Division Pre Monsoon and Post Monsoon. Also mean, SD has also been studied for correlation in pre-monsoon and post-monsoon periods. It is clear from this that the factors that change in both the periods are at the same rate. In short X and Y values are mutually dependent or have a strong positive correlation.

6. CALCULATION OF WATER QUALITY INDEX AND PHYSICO-CHEMICAL ANALYSIS

The natural and man-made sources of water pollution, man-made water pollution has the highest intensity [5,7] . Therefore, various water tests have been done in this research as follows. pH is a measurement of electrically charged particles in a substance. It indicates how acidic or alkaline (basic) that substance is. The pH scale ranges from 0 to 14:

The Acidic water has a pH lower than 7. The most acidic substances have a pH of 0. Alkaline water has a pH of 8 or above. The most alkaline substances, such as lye, have a pH of 14. Pure water has a pH of 7 and is considered "neutral" because it has neither acidic nor basic qualities. The scale of PH elements of the water is 0.50 to7.50, We find highest PH water element in Ashwi site (8.18 PH) and lowest ph water elements in Kalas (7.8 PH) village and in Bhandardara and Nilwande site having 7.28 and 7.62 PH water elements respectively.

The Ashwi site pravara river Ph was more than 8 thus this water is alkaline water. Because of Alkalinity in a solution means the solution is capable of buffering acidic solutions with higher concentrations of hydrogen ions. Alkalinity in water comes from a high concentration of carbon-based mineral molecules suspended in the solution. Water with high alkalinity is said to be "hard." The most prevalent mineral compound causing alkalinity is calcium carbonate, which can come from rocks such as limestone or can be leached from dolomite and calcite in the soil. Water treatment plants can be treated to a higher alkalinity. The source of high PH in Ashwi site agricultural fertilizers, waste water of Sagmaner city ect. In short these site not good conditions of water for drinking propose. The scale or range of water salinity 0.00 to 0.25, we find highest salinity water element in Ashwi Village (0.87 mg/l) and lowest salinity water elements in kalas (0.6 mg/l) village. The Bhandardara and Nilwande this two site having 0.43 and 0.51 mg/l salinity water elements respectively. The ashwi site Pravara River water has not suitable for drinking and irrigation proposes but carful used of water in drinking proposes.

The water elements of Bhandardara, Nilwande, Kalas and Ashwi sites. According to WHO, the scale of Calcium elements of the water is 0.00 to 1.50, We find highest calcium water element in Ashwi site (3.6) and lowest calcium water elements in Bhandardara (0.8) site. And in Kalas and Nilwande village having 1.4 and 1.2 calcium water elements respectively. The scale of Magnesium elements of the water is 0.00 to 5. We find highest magnesium water element in Ashwi site (4.4) and lowest magnesium water elements in Bhandardara (3) village. And in Kalas and Nilwande sites having 3.8 and 3.6 magnesium water elements respectively. The scale of sodium elements of the water is 0.00 to 4.00. We find highest calcium water element in Ashwi site (4.4) and lowest calcium water elements in Bhandardara (1.4) site. And in Kalas and Nilwande sites having 2.5 and 2.4 sodium water elements respectively.

The scale of potash elements of the water is 0.00 to 0.00. We find highest potash water element in Ashwi and kalas sites is same (0.05). Lowest calcium water elements in Bhandardara and Nilwande site (0) is the two lowest water elements Bhandardara and Nilwande site respectively.

The scale of carbonate elements of the water is 0.00-1.50. We find highest magnesium water element in Ashwi site (4.4) and lowest magnesium water elements in Bhandardara (3) site and in Kalas and Nilwande site having 3.8 and 3.6 magnesium water elements respectively. The scale of bicarbonate elements of water is 0.00-1.50we find the highest bicarbonate water elements in Ashwi site (7.2) and lowest bicarbonate water elements in Bhandardara village (4.8) and kalas and Nilwande (6.4) and(5.6) bicarbonate water elements respectively. The scale of chlorides elements of water is 0.00-2.00 we find the highest chlorides water elements in Ashwi site (7.6) lowest water elements in Nilwande site is (2.6) in Bhandardara and kalas site having 5.2 and 6.8 chlorides water elements respectively . The scale of sulfate elements of the water is 0.00 to 2.00. We find highest sulfate water element in Ashwi site (1.7) and lowest sulfate water elements in Bhandardara (1) site and in Kalas and Nilwande site having 1.5 and 1.2 sulfate water elements respectively. The water elements of Bhandardara, Nilwande, Kalas and Ashwi sites. According to WHO, the scale of sodium stable ratio elements of the water is 0.00 to 10.00 We find highest sodium stable ratio water element in Ashwi site (2.2) and lowest sodium stable ratio water elements in Bhandardara (1.01) site and in Kalas and Nilwande sites having 1.54 and 1.55 Sodium Stable Ratio water elements respectively. The residual sodium carbonate (RSC) index of irrigation water or soil

water is used to indicate the alkalinity hazard for soil. When dissolved sodium in comparison with dissolved calcium and magnesium is high in water, clay soil swells or undergoes dispersion which drastically reduces its infiltration capacity. The scale Residual Sodium Carbonate elements of the water is 0.00 to 1.25 We find highest Residual Sodium Carbonate water element in Kalas site (1.2) and lowest Residual Sodium Carbonate water elements in Ashwi (0) site and in Bhandardara and Nilwande sites having 1 and 0.8 Risidual Sodium Carbonate water elements respectively.

7. CONCLUSION

Water is supplied locally through various schemes so that human beings have the first duty to get clean water. Although the source of water is rain, it is available to human beings in many ways, mainly through various means such as rivers, streams, lakes, well, tube well. Humans use water for a variety of purposes, mainly for domestic use, for industrial purposes, and for agriculture and other businesses. The excessive application of chemical fertilizers and pesticides for high yielding crop as well as over irrigation are said major causes of high level salinity. It has long tradition of over irrigation and use of fertilizers for mainly sugarcane. As we move from Bhandardara to Ashwavi, in brief from west to east, the pH and salinity of the water increases. They mainly water salinity, water pH and other chemical factors are higher in water here than in other places. Because a large amount of polluted water goes to this river from Sangamner city and around area. PH values shows, slightly alkaline nature of river water. It is within the limit of drinking purpose. Gradual increase in alkalinity and hardness was found from upstream to downstream. Increase in chloride concentration towards downstream may be due to increase in sewage contamination. Calcium, Magnesium, Phosphate and Nitrate shows fluctuation along different station due to addition of sewage contamination. The wider human activity and the domestic waste cause the eutrophication. The wider human activity and domestic waste cause the eutrophication. Contaminated water levels are less in post monsoon than in pre monsoon. Because the river Pravara receives fresh water during this period and the flow of water is continuous.

CONFLICT OF INTERESTS

None

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