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STUDY OF IONIC STATUS OF STRETCH OF WAINGANGA RIVER WATER, IN VIDHARBHA REGION OF MAHARASHTRA STATE: IMPACT OF HUMAN ACTIVITIES

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ABSTRACT:

At Conductivity of river water increases during the summer and decrease during winter season. High concentration of municipal wastes and domestic activities and less flow of river during summer is responsible for increase of ionic contents in water and conductivity. However, more flow of river in the rainy season and winter dilute the pollutants to some extent and lowers the ionic contents of water (Thomas et al., 2001). It is evident from the observations that, conductivity attains peak values in the months of summer. This may be due to higher chlorides and total dissolved solid contents in river water during summer. The data collected shows that, lower values of conductivity at station A in comparison with the other stations, since, there is no significant source of pollution. The reduced rate of decomposition activities

Keywords: River, Ionic, pH, TDS, Conductivity, Contamination, Human

INTRODUCTION:

Rivers are the life line of human beings since the starting of human civilization. According to ancient history the base of human civilizations occurred nearby areas of water bodies. Food, fodder, clothing and home are the basic needs of mankind to live on earth. But it is very true that these basic needs appear on earth due to presence of water on earth. Nearly 1% water is available on earth in the easily consumable form of fresh water, which is being stored in surface water bodies and in soil. Chemically no any form of water is pure on earth except double distilled water as the water located on land surface in the form of water bodies is contaminated by soil chemicals and organic matters from available biota. In general the waters are called as pure those fulfill the normal ranges of contamination by organic matter and do not harm the body tissues of living beings. Naturally the water present in the land surface is continuously going on mixing with soil chemicals, remains of plant and animals and microbes and in worst case the human domestic and agricultural activities related to water.

MATERIAL AND METHODS:

Wainganga River is a tributary of the Godavari River, western India. Its name, which means "Arrow of Water," was probably derived from the names of the goddess Ganga and of Venu, or Benu, a king who ruled in Damoh during Pauranic times. The Wainganga rises in the Mahadeo Hills in south-central Madhya Pradesh state and flows 360 miles (580 km) south to join the Wardha River (a headwater of the Godavari), northeast of Kagaznagar in Maharashtra state. Along the final 142 miles (229 km) of its course, the river forms the boundary between Maharashtra and Telangana states and is known as the Pranhita. The river receives water from numerous tributaries, notably the Bagh, Bawanthadi, Kanhan, Chulband & Garhvi, and Thanwar rivers. The river drains into the eastern Nagpur plain and the areas around Seoni and Chhindwara. During the rainy season the river is navigable for only a short distance upstream from the confluence with the Bagh River. Timber is floated down the river, and grain and vegetables are carried short distances by boat. The Wainganga River valley is forested and relatively sparsely populated, except in the northern industrial area around Nagpur in Maharashtra state. Most of the population is concentrated along the river, where rice is extensively irrigated. Major river towns in Maharashtra include Kamptee, Bhandara, Tumsar, Balaghat, and Pauni.

For present study the whole stretch of Wainganga river water flowing in the Maharashtra state is selected. The 5 sampling stations were selected to assess the ionic combination of water in relation to natural and anthropogenic interference. The river water is transported in plastic bottles kept in ice boxes.

Station-A. Wainganga River near Bapera, Station-B. Wainganga River at Tiroda Tumsar Road, Station-C. Wainganga River near Kardha, Station-D. Wainganga and Chulbandh confluence at Soni,

Station-E. Wainganga River near Itan, Station-F. Wainganga river in Pauni

Hydrogen ion concentration of water is measured by the electronic Ph meter with LCD display, with keeping the probe in standard solutions. In bi monthly-sampling of water, 6 samples were collected from each station from different areas at each visit. Electrical conductivity of water is measured by the conductometer in laboratory. Total dissolved solids are estimated by the evaporation of standard volume of water and measurement of remaining salts by electronic balance. For each time of experiment the care is taken for the calibration of instruments by standard methods.

OBSERVATION:

Table-1

Stations	Hydrogen ion Conc.		
	Rainy Season	Winter Season	Summer Season
A	7.28±0.18	7.52±0.17	7.53±0.41
B	7.33±0.23	7.25±0.45	7.54±0.11
C	7.57±0.07	7.63±0.16	7.44±0.22
D	7.51±0.28	7.41±0.19	7.59±0.39
E	7.42±0.082	7.21±0.011	7.79±0.29
F	7.41±0.24	7.38±0.28	7.55±0.14

Table-2

Stations	Conductivity		
	Rainy Season	Winter Season	Summer Season
A	347±12	325±18	360±32
B	348±09	312±35	451±34
C	369±42	311±21	388±33
D	365±27	317±18	372±29
E	368±38	328±35	455±52
F	370±22	325±28	379±43

Table-3

Stations	Total Dissolved Solids		
	Rainy Season	Winter Season	Summer Season
A	302.56±12.2	168.98±10.1	286.11±17.4
B	498.25±24.8	311.85±15.9	418.46±35.4
C	401.27±19.4	221.37±10.5	194.8±9.43
D	437.11±35.2	366.87±26.7	397.65±18.9
E	398.21±16.3	370.45±14.8	341.56±12.9
F	317.12±14.7	217.67±11.5	362.8±23.2

Table-3

Stations	Temperature		
	Rainy Season	Winter Season	Summer Season
A	27.18±0.13	25.31±0.24	32.6±0.39
B	26.38±0.11	24.11±0.23	31.7±0.26
C	27.11±0.14	24.54±0.18	32.8±0.45
D	25.21±0.19	24.17±0.51	31.6±0.11
E	26.37±0.12	24.11±0.16	30.94±0.63
F	23.71±0.12	25.01±0.17	31.71±0.59

Fig.1.

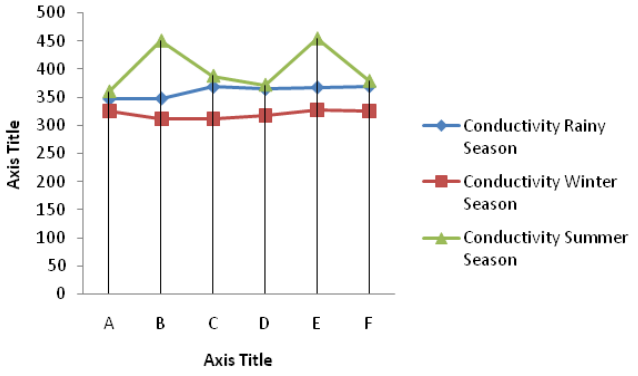


Fig.2

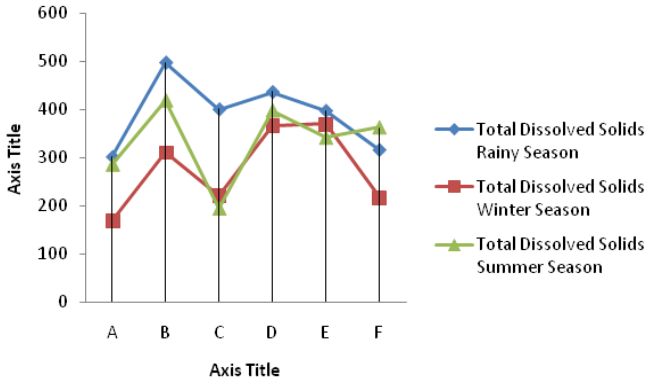


Fig.3.

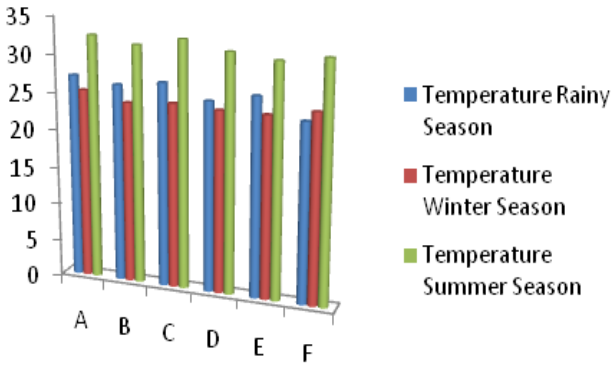
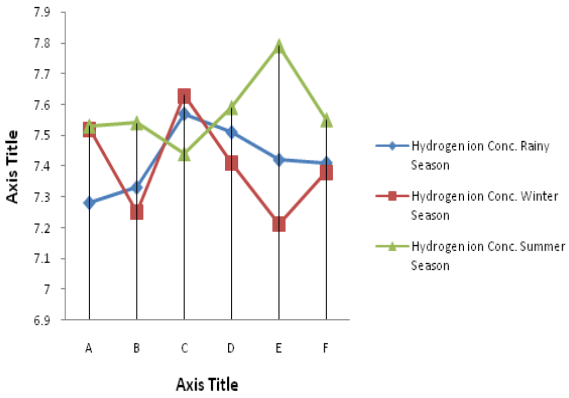


Fig.4.



RESULT AND DISCUSSION:

Present investigation concluded that the ionic concentration of Wainganga river water enhances mainly during the summer. At all the stations increased values of pH and conductivity during the summer days with increase in temperature of river water throws light on extent of contamination water. Reduced volume of water in river basin imparts concentration of pollutants mainly the bottom sediments.

Present investigation on pollution study especially due to human activities throws light on sustained human practices associated with Wainganga river water and pollution status of river in the study area.

Station A or river is having less population of localities along the stretch or resides at some distance, and there is no more impact of localities on the status of river water. The values of hydrogen ion concentration, Conductivity and total dissolved solids are maintained on the basis of bottom sedimentation and its extent of degradation bottom organic matter. The enhanced values of ionic concentration are noted during rainy season, which is due to addition of surface runoff containing organic matter and humus. Shivanikar (1998). As the stretch of river within study area flows through rice fields, and more rice mills in the study area, produces more quantity of humus at the catchment area of station A.

In comparison with station the downstream river water at station B indicates more contamination. Many direct and indirect sources of pollutants collectively contaminate the river water. Intense fisherman activities, cattle activities are mostly responsible for the increased values of pH, Conductivity, TDS and temperature of river water.

River water near khardha (Station C) during summer showed highly increased hydrogen ion concentration, TDS and Conductivity with increased water temperature. The localities of Bhandara and Kardha villege residing along the bank of river perform their domestic activities along the river basin. Washerman activities, Utensil washing, dumping of garbage by localities and additions of plenty of detergents in river water is mainly responsible to enhance the ionic status carbonates and bicarbonates. However, a cattle activity especially the traditional human techniques of thermoregulation of cattles (buffaloes) during summer season is a main source contamination of water bodies in Vidharbha region of Maharashtra state. A.N Lonkar, et al, (2015). Resting of cattles in the river basin harms the water by two ways i,e by inducing organic matter in the water and by mixing of bottom sediments in the water. More over the wastes from the minor waste water channels made by localities is one of the reason of increased values of parameters at this station.

No doubt river water itself overcome or stabilize the effect of pollutants by dilution effect, but the stretch of river containing the un stabilized organic matter harms the flora and fauna.

At station D the intense fisherman activities observed with prawn fisheries with use of organic bait. During summer season the values of all parameters remains moderate. This may be due to relatively more water and more depth of water in the river basin. The localities reside at the vicinity of station D are fisherman community, which is totally depends on river water for their domestic activities including bathing also. During rainy season surface runoff from both the rivers (confluence) containing humus and other organic matter contaminate water on great extent and impart more ionic concentration to the water. Bobdey, (2015), During summer days degradation of surface sediments maintains the ionic status of river water.

Station E is also characterized by intense fisherman activities and prawn fisheries with less human activities. There is no significant impact of human domestic activities at this station except fisherman activities and river water showed comparatively less values of Conductivity and TDS in comparison to upstream station.

Present investigations indicate that the stretch of river water in the vicinity Pauni town, from Gose dam to pauni town is having much sources of contamination of water. The localities continuously add garbage, religious wastes, and domestic wastes (through waste water channels) in to the river water. Cattle activities are also observed more in the region of station F. During the summer season it makes condition more miserable.

During winter and summer, the preparation of fish hiding places in the middle of river basin by fisherman is the significant source of pollution in whole study area. The dried branches of herbs and shrubs are deposited in the river for hiding of fishes. The fishes hide nearby these hiding areas and netting at these areas gives more fish caught. No doubt it gives more yield for fisherman community but the degradation of decaying of dried branches contaminate river on great extent, which is responsible to enhance the values of all parameters.

Present work also indicated the impact of river water agriculture in river basin. During

summer the dried places present along the whole stretch of river are used for the plantation of Watermelon and Muskmelon. Such crops are observed in the river basin during whole days of summer season. The use of cow dung manure as a fertilizer for the crops and insecticide sprays affect river water on great extent. Continuous mixing of manures containing N and P in the water and its degradation impart high ionic status to the river water. Bhagat & Bobdey, (2009),

At some stations conductivity of river water increases during the summer and decrease during winter season. High concentration of municipal wastes and domestic activities and less flow of river during summer is responsible for increase of ionic contents in water and conductivity. However, more flow of river in the rainy season and winter dilute the pollutants to some extent and lowers the ionic contents of water (Thomas et al., 2001). It is evident from the observations that, conductivity attains peak values in the months of summer. This may be due to higher chlorides and total dissolved solid contents in river water during summer. The data collected shows that, lower values of conductivity at station A in comparison with the other stations, since, there is no significant source of pollution. The reduced rate of decomposition activities at the lower temperature of water in the winter also affects the ionic concentration, Bobdey, (2015).

The study period spread over two years shows that, the values of river water has a regular and gradual increase in conductivity from upstream station B to downstream station F, in all seasons, (Shukla et al., 1989). The Wainganga river water has higher conductivity in summer.

Present investigation indicates that, the pH of water increases in the winter days. This may be due to discharge of organic wastes directly or indirectly in river water. However increase of carbonates and bicarbonates concentration in the river water, is responsible for maximum values of pH in winter.

More turbid water due to more loads of pollutants affects the photosynthetic activities of phytoplanktons and their assimilation of CO2 and bicarbonates from water (Mohanta and Patra, 2000).

During summer the value of TDS gradually increases from February to May with decrease of water level in river. The values of TDS in Wainganga river may be due to sodium, potassium and chlorides in the river sediments. However, the activity of cloth washing and bathing adds the carbonates and bicarbonates of Na, Ca, K and Cl at station F in river water. During rainy season the surface runoff soil, clay, etc., transfers enormous amount of solids in river water along with rainwater. The silting of rocks due to flooded water carries the salts of Mg, Fe and Cl, which imparts the more concentration of dissolved solids in river water.

The present study showed conductivity of river water increases during the month of summer and decrease during winter season. High concentration of organic wastes and domestic activities and less flow of river during summer is responsible for maximum conductivity. The dilution of pollutants to some extent is affected due to increased flow of river during winter months and lowers the ionic contents of water. The reduced rate of decomposition activities in the lower temperature of water also affects the ionic concentration in river water. During rainy season, the surface runoff from the catchment areas maintains the ionic content in river water. Bobdey, (2015) The Wainganga river water has higher conductivity in summer; the values are more than permissible level.

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