Assessment of water quality: A case study in and around the Kanakapura (T) and Harohalli Industrial area

Dr. Babith Rani.H, Shivakumar.S, Dimple Bahri, Pallavi R, Sindhu S, Chandana R, Meer Hassan, Mohammed Sakib

***Abstract*- The study is carried out to find the water quality in and around Kanakapura (T) and Harohalli industrial area. The water sample is collected from various parts of Kanakapura(T) and Harohalli industrial area. The collected samples were analyzed for various physical and chemical parameters i.e pH, total hardness, chloride, nitrate, iron, fluoride using standard methods. From this present study, it's concluded that the surface water pollution in Kanakapura(T) and Harohalli industrial area is high and it is due to uncontrolled, unregulated effluents and waste water from industries. Many industries of these areas do not have treatment plants, hence discharge directly their effluents into water bodies. The present study also indicates that water quality in kanakapaura region is totally effected by industrialization, which adversely effecting human and other vegetation as per standards.**

***Index Terms*- water pollution, Indian standards, control measures, Industrialization.**

INTRODUCTION

Water is one of the important source in our daily life, without water there is no life on our planet. We need water for different purposes like drinking, industries, irrigation, swimming and fishing etc. Almost 80% of the water bodies in India are polluted due to the discharge of untreated domestic sewage and partially treated industrial effluents into the natural water sources(Ensink et al., 2009; CPCB 2007a). Contaminated drinking water causes various diseases such as typhoid fever, dysentery, cholera and other intestinal diseases (Udoh,1987;Adeyami,2004;Dixit and Shanker,2009). Water pollution include sewage and waste water, industrial waste, oil pollution, atmospheric deposition, global warning etc. (Gambhir et al.,2012). Water pollution can be prevented by stopping pollutants from contaminating nearby water bodies. There are a numerous water treatments to prevent pollution such as biological filters, chemical additives and sand filters. These simple techniques cost money to maintain, but prevention is much economical than cleaning up water pollution that has already occurred (WHO, 2012s).

Safe drinking water is essential for health, the basic human right and a component of effective policy for health protection (WHO 2013). Untreated discharge of pollutants into a river from domestic sewers, storm water discharges, industrial waste water, agricultural runoff and other sources can have short term and long term effects on the water quality of a river system(Singh,2007; Varghese et al.,2011; Rai et al.,2012; Giri and Singh,2014). Water can be contaminated by many sources such as garbage dumps, leaking fuel storage tanks and intentional dumping of hazardous substances. Treated sewage may contain large amount of nitrates, every water body must be analyzed on a regular basis to confirm to suitability. In this case study analysis of water samples taken from various water sources around the kanakapura (T) is done.

Construction of new wells with approved plastic casing, volatile organic analysis may detect by-products of construction such as methyl ethyl ketone (MEK) and tetrahydrofuran(THF). The physical and chemical characteristics of drinking water vary.

Materials and Methods

Study area :

Kanakapura is located at 12.55°N 77.42°E. It has an average elevation of 638 m (2093 feet) and is situated 55km south to Bangalore on National highway, NH209 on the banks of the river Arkavathi. Kanakapura is a town and the headquarters of Kanakapura (T) in the Ramanagar (D) in the state of Karnataka, India. Situated 55km away from the Bangalore, town is known for the production of silk and granite.

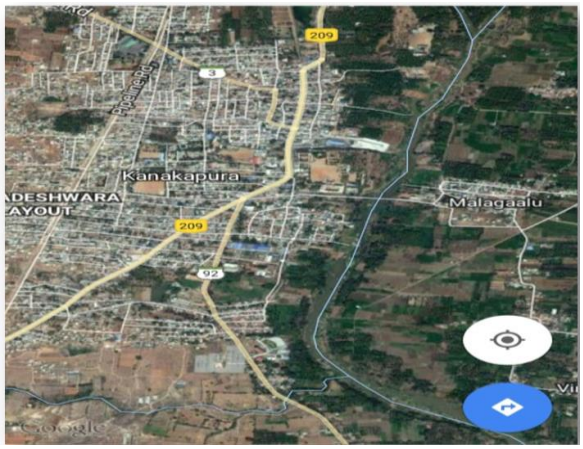
Materials

Water sample were collected from Kanakapura(T) and Harohalli industrial area are analyzed. It was collected from surface and subsurface water bodies apart from the collection of water, observation

checklist was also employed to make visual and qualitative assessment of activities in the area.

METHODS

Water samples were analyzed for physical and chemical characteristics. The physical parameter pH is measured by using pH meter with electrode and by using certain chemicals. Chemical parameters such as hardness, chloride, nitrate, iron and fluoride are determined. Hardness in water is determined by using titration with certain chemical reagents, chloride and iron is measured by using spectrophotometer, fluoride is measured by using distillation method.



Test Results on Various Samples from Different Places in and around Kanakapura (T) and Harohalli industrial area

Sample 1:Ganal doddi near Harohalli Industrial Area

SL NO	PARAMETERS	TEST RESULTS	DESIRABLE	PERMISSIBLE	TEST METHOD
1	Total hardness	134.0	Max 200	Max 600	IS:3025(P21)2009
2	Chloride	20.1	Max 250	Max 1000	IS:3025(P32)1988
3	Fluoride	0.2	Max 1.5	Max 1.5	IS:3025(P60)2008
4	Ph	7.13	6.5-8.5	No Relaxation	IS:3025(P11)1983
5	Nitrate	4.8	Max 45	No Relaxation	IS:3025(P34)1988
6	Iron	Below detection limit(D1:0.02)	Max 0.3	No Relaxation	IS:3025(P53)2003

REMARKS: The samples compared to IS 10500:2012 specification with respect to tested parameters only.

Sample 2: Ganal doddi near Harohalli Industrial Area Surface water

SL NO	PARAMETERS	TEST RESULTS	DESIRABLE	PERMISSIBLE	TEST METHOD
1	Total hardness	169.1	Max 200	Max 600	IS:3025(P21)2009
2	Chloride	101.4	Max 250	Max 1000	IS:3025(P32)1988
3	Fluoride	0.1	Max 1.5	Max 1.5	IS:3025(P60)2008
4	Ph	7.29	6.5-8.5	No Relaxation	IS:3025(P11)1983
5	Nitrate	5.9	Max 45	No Relaxation	IS:3025(P34)1988
6	Iron	0.8	Max 0.3	No Relaxation	IS:3025(P53)2003

REMARKS: The sample compared to IS 10500:2012 specification with respect to tested parameters only.

Sample 3: Tungani Agricultural Area Surface Water

SL NO	PARAMETERS	TEST RESULTS	DESIRABLE	PERMISSIBLE	TEST METHOD
1	Total hardness	109.3	Max 200	Max 600	IS:3025(P21)2009
2	Chloride	159.5	Max 250	Max 1000	IS:3025(P32)1988
3	Fluoride	0.5	Max 1.0	Max 1.5	IS:3025(P60)2008
4	Ph	7.88	6.5-8.5	No Relaxation	IS:3025(P11)1983
5	Nitrate	<1.0	Max 45	No Relaxation	IS:3025(P34)1988
6	Iron	0.15	Max 0.3	No Relaxation	IS:3025(P53)2003

REMARKS: The sample compared to IS 10500:2012 specification with respect to tested parameters only.

Sample 4 : Tungani Ground Water

SL NO	PARAMETERS	TEST RESULTS	DESIRABLE	PERMISSIBLE	TEST METHOD
1	Total hardness	310	Max 200	Max 600	IS:3025(P21)2009
2	Chloride	260	Max 250	Max 1000	IS:3025(P32)1988
3	Fluoride	0.5	Max 1.0	Max 1.5	IS:3025(P60)2008
4	Ph	7.0	6.5-8.5	No Relaxation	IS:3025(P11)1983
5	Nitrate	20	Max 45	No Relaxation	IS:3025(P34)1988
6	Iron	0.1	Max 0.3	No Relaxation	IS:3025(P53)2003

REMARKS: The sample compared to IS 10500:2012 specification with respect to tested parameters only.

Sample 5: Near Jain College

SL NO	PARAMETERS	TEST RESULTS	DESIRABLE	PERMISSIBLE	TEST METHOD
1	Total hardness	103.1	Max 200	Max 600	IS:3025(P21)2009
2	Chloride	18.0	Max 250	Max 1000	IS:3025(P32)1988
3	Fluoride	0.2	Max 1.0	Max 1.5	IS:3025(P60)2008
4	Ph	8.41	6.5-8.5	No Relaxation	IS:3025(P11)1983
5	Nitrate	1.6	Max 45	No Relaxation	IS:3025(P34)1988
6	Iron	0.06	Max 0.3	No Relaxation	IS:3025(P53)2003

REMARKS: The sample compared to IS 10500:2012 specification with respect to tested parameters only.

Sample 6: Harohalli Industrial Area Surface Water

SL NO	PARAMETERS	TEST RESULTS	DESIRABLE	PERMISSIBLE	TEST METHOD
1	Total hardness	268.0	Max 200	Max 600	IS:3025(P21)2009
2	Chloride	279.9	Max 250	Max 1000	IS:3025(P32)1988
3	Fluoride	0.6	Max 1.0	Max 1.5	IS:3025(P60)2008
4	Ph	7.34	6.5-8.5	No Relaxation	IS:3025(P11)1983
5	Nitrate	2.3	Max 45	No Relaxation	IS:3025(P34)1988
6	Iron	0.95	Max 0.3	No Relaxation	IS:3025(P53)2003

REMARKS: The sample compared to IS 10500:2012 specification with respect to tested parameters only.

Sample 7: Bandebasappan doddi Near Temple

SL NO	PARAMETERS	TEST RESULTS	DESIRABLE	PERMISSIBLE	TEST METHOD
1	Total hardness	320	Max 200	Max 600	IS:3025(P21)2009
2	Chloride	360	Max 250	Max 1000	IS:3025(P32)1988
3	Fluoride	0.7	Max 1.0	Max 1.5	IS:3025(P60)2008
4	Ph	7.05	6.5-8.5	No Relaxation	IS:3025(P11)1983
5	Nitrate	20	Max 45	No Relaxation	IS:3025(P34)1988
6	Iron	0.2	Max 0.3	No Relaxation	IS:3025(P53)2003

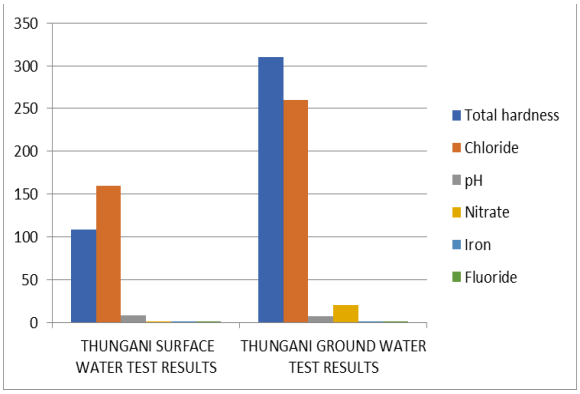
REMARKS: The sample compared to IS 10500:2012 specification with respect to tested parameters only.

Sample 8: Kurigowdan doddi Near Muneshwara Temple

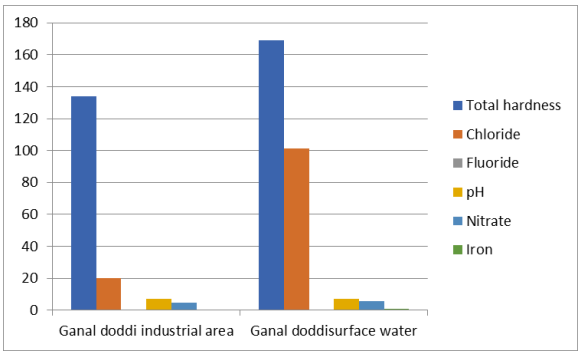
SL NO	PARAMETERS	TEST RESULTS	DESIRABLE	PERMISSIBLE	TEST METHOD
1	Total hardness	360	Max 200	Max 600	IS:3025(P21)2009
2	Chloride	320	Max 250	Max 1000	IS:3025(P32)1988
3	Fluoride	0.8	Max 1.0	Max 1.5	IS:3025(P60)2008
4	Ph	7.5	6.5-8.5	No Relaxation	IS:3025(P11)1983
5	Nitrate	25	Max 45	No Relaxation	IS:3025(P34)1988
6	Iron	0.1	Max 0.3	No Relaxation	IS:3025(P53)2003

REMARKS: The sample compared to IS 10500:2012 specification with respect to tested parameters only.

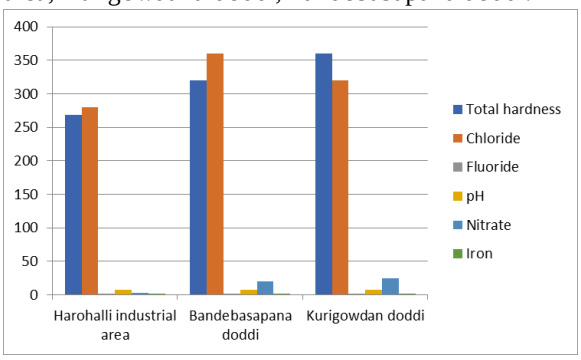
Graph 1: Comparison between Tungani ground water and surface water



Graph 2: Comparison between Ganal doddi industrial area and surface water



Graph 3: Comparison between Harohalli industrial area, Kurigowdana doddi, Bandebasapana doddi.



RESULTS AND DISCUSSION

Water samples from various places around Kanakapura and Harohalli industrial area, it consist of various pollutants. The pH should be between 0 to 7, where pH is more near Jain university and less at Tungani. Ground water where desirable between 6.5 and 8.5. pH of a solution can be found easily by using pH strips (paper) or a pH meter gives very accurate values. Hardness is high comparatively and it is formed when water percolates through deposits of calcium and magnesium containing minerals such as limestone, chalk and dolomite. Hardness in water is high at Kurigowdan doddi which is 360 and less at Tungani surface water which is 109.3 where desirable is 200. Hard water will not effects the human health seriously, but in industries it will leads to serious problems such as breaking of boilers, cooling towers and other equipment. Water hardness is determined by the concentration of multivalent cations in the water. There are two types of hardness in water, they are temporary and permanent hardness. Temporary hardness is a type of water hardness caused by the presence of dissolved bicarbonate minerals. Permanent hardness is usually caused by presence of calcium sulfate. It can't be removed

easily by boiling. Softening is often desirable to soften hard water, but it is required only for the water which is sent to domestic hot water systems. In collected samples it is found that Bandebasapana doddi water sample consist more chloride content which is 360 and Tungani surface water consist 159.5 where desirable is 250. Sea water contains 1.94% chloride, some chloride containing minerals include the chlorides of sodium, potassium and magnesium, hydrated mgcl2, called serum chloride. The major application of intensive removal of chloride salts to give potable water. Due to this salts some corrosion are takes place in tanks and also it causes the hyperchloremia at high level and hypochloremia at low level. Causes of hyperchloremia are kidney failure, high levels of blood sodium, diabetes insipidus, diarrhea, vomiting, respiratory losses. It has human health impacts as well as aquatic life impacts. In drinking water of kanakpura taluk and harohalli industrial area we found a nitrate content which is more at kurigowdana doddi around 25 and less at tugni surface water where it is less than 1 and desirable is max 45. Nitrate is a naturally occurring form of nitrogen found in soil, it is essential for our life. It can be expressed as either NO3 or NO3-N. Due to high mobility, nitrate also can reach ground water. If people or animals drink water high in nitrate, it may cause methemoglobinemia, an illness found in especially in infants. Sources of nitrate in water are fertilizers, manure, animals feedlots, municipal wastewater, sludge, and septic systems. The major sources of nitrates in drinking water are runoff from fertilizers use, leaking form septic tanks, sewerage and erosion of natural deposits. For removing of nitrate to below 10mg/l some treatments are adopted such as ion exchange, reverse osmosis and electro dialysis, blending. Nitrates symptoms are methemoglobinemia that leads to bluish color of the skin, particularly around the eyes and mouth. Due to this some health issues are takes place such as bule baby syndrome, shortness in breathe, affects the aquatic life. It is found that iron content is more at Ganal doddi surface water which is 0.8 and less at Ganal doddi industrial area which is 0.02 and desirable is max 0.3. Iron although present in drinking water, it is seldom found at concentrations greater than 10mg/l and is mainly present in water in two forms, either the soluble ferrous iron or the insoluble ferric iron. Water containing ferrous iron is clear and colorless because the iron is completely dissolved. Some symptoms are due to this iron are dry, itchy skin, dull hair, worn, scratchy clothes, lime scale or other build up around drains, faucets and fixtures. Iron gets into well by two such seepage and corrosion. Iron plays an important role in human nutrition in this formation of the protein hemoglobin, which transport oxygen to all cells of the body, fatigue, weight loss and joint pain. Fluoride is naturally occurring in water and it is found more at kurigowdan doddi which is 0.8 and less at Ganal doddi surface water which is 0.1 where permissible is max 1. Rivers and lakes generally contain fluoride levels less than 0.5mg/l but ground water, particularly in volcanic can contain as much as 50mg/l. fluoride compounds are salts that form when the element, fluorine with minerals in soils. Fluoride is a common element that does not occur in the element state in nature because of its high reactivity. In most the drinking waters, over 95% of total fluoride is the F-ion, with magnesium-fluoride complex. The symptoms of this fluoride are arthritis, asthma, bony, chronic fatigue syndrome, cold, dental fluorosis, diabetes. Fluoride compounds such as sodium fluoride, fluorosilicates dissolves easily into the ground water as it moves through gaps between rocks.

Remedial measures

1.Total Hardness in water :

It can be done by conversion of soluble compounds into insoluble particulates for separation. Sedimentation or infiltration is commonly used for water softening and soluble metals, dissolved natural organic matter may also be achieved.

2.Nitrate in water:

Use of treatment process such as ion exchange, reverse osmosis, biological densification and chemical reduction to remove the pollutants.

3.Iron in water:

Water softeners are used to remove dissolved ferrous iron by ion exchange method, precipitated iron can be removed by filtration method.

4.Chloride in water:

Chloride can be removed from reverse osmosis, distillation, de-ionization.

CONCLUSION

The present study indicates that industrialization is causing pollution in the water content. Surface and Ground water pollution due to industrial, agriculture

waste discharge to the surface water is also one of the environmental problem. By this study, it can be concluded that the surface water pollution in kanakapura taluk along the industrial areas is high and it is due to uncontrolled, unregulated effluents of waste water from industries. As per current water quality standards, it is unfit for human consumption and can be noted as polluted water. It is therefore recommended that the careless disposal of industrial waste without pretreatment should be stopped to save the river water from further deterioration.

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