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A Study of the Physiochemical Effect of Industrial waste on Water Quality of Agyara Dam, Alwar

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ABSTRACT

In the present study we have discuss about the present scenario of the Physiochemical Effect of Industrial waste on water quality of Agyara Dam, This is one of a series of information prepared in relation to specific human activities which are of significant concern for the which is assessed by examine various physio-chemical parameters of polluted water of this Dam. The study reveal that the water quality of Agyara Dam has deteriorated/contaminated over a period of few years because of discharge of untreated or partially treated wastewater/effluents generated from the industries located at Matsya Industrial Area, Alwar and dumping of solid waste in haphazard manner on road sides. The colour of water of Agyara Dam is converting from Muddy to Pink but the waste water flowing from MIA through nallahs appears to be Grey. It may be possible that colour might have changed due to some microbial or bio-chemical reactions. All parameters of water quality viz pH, total dissolved solid (TDS), calcium hardness, magnesium hardness, fluoride, chloride, nitrate etc. should be in permissible limits. If one of these parameters crosses the limits of concentration, it may cause disease and such water is known as impure or contaminated water. It should not be used for drinking/agriculture purposes, because water works as a solvent in all metabolic reactions of human body.

KEYWORDS:- Agyara Dam Alwar, water, pH, TDS, Hardness, chloride, fluoride, Sulphate, Nitrate, Water Quality, Sulphate.

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INTRODUCTION

WATER is a vital factor in life, which constitute 80% of protoplasm, a physical basis of life. The human body contains 70% of body weight in the form of water. The history of man has always been marked by an intimate relationship with water. It is well known that the earliest Paleolithic implements of human existence have been traced in the river gravels. Water is the basis of all life forms and absolute necessity comprising domestic, agricultural and industrial activities. Even in this modern scientific era mankind has to depend on water for countless direct and indirect ways. Although India has substantial fresh water resources there is an acute shortage of safe drinking water of acceptable quality, specially in rural areas.[1] Water is an essential substance which plays a significant role in the daily life of living organisms. It also influences climatic changes and land shaping. Groundwater is one of the primary water sources which are a key driver of the domestic, industrial, and agricultural sectors. Over the past few decades, water demand has been increasing continuously due to increasing water and energy balance by all these sectors and continuous increases in population, leading to water shortage and quality degradation.

Water is the biggest necessity for life. Drinking water is obtained from a variety of sources, depending on availability of surface water (rivers, lakes, reservoirs and ponds) and groundwater (aquifers). In developing countries like India, groundwater is the most important source for drinking water, irrigation and industrial purposes. People in rural as well as urban areas are dependent on groundwater for their domestic and occupational needs[2]. Groundwater constitutes about two third of the freshwater resources of the world and if the polar ice caps and glaciers are not considered, groundwater accounts for nearly all usable freshwater. But due to widespread use of harmful chemicals in agriculture, pollution of rivers, industrial effluents etc., and the groundwater is getting increasingly contaminated with pollutants. The physiochemical characters of water can be changed by inflow of different pollutants and nutrients through different sources like sewage, industrial effluents, agricultural runoff, etc.[3]

If these effluents are not treated before their disposal, they can be harmful for human consumption. Communities, which rely on untreated surface water and groundwater supplies for domestic and agricultural uses are the most exposed to the impact of poor water quality. The chemicals, physical and biological aspects of water quality are inter – related and must be considered together[4]. Water quality is highly variable over time due to both natural and human factors. It is well known that polluted water consumptions or deficient sanitation is often the direct cause of outbreak of water borne

diseases. The quality of water is of vital concern for mankind since it is directly linked with human welfare. Water pollution can be best considered in the perspective of possible pollutant cycles throughout the environment. Water pollution disturbs the normal uses of water for irrigation, agriculture, industries, public water supply and aquatic life. In India about 80% of water supply of a city finds it way back into the drainage system as domestic and industrial waste. These are discharged into the water bodies without being treated properly. According to NEERI about 75% of India's inland water is unfit for human consumption. The major cause of deterioration of water quality in India is the discharge of industrial wastewater.

Waste water from dyeing industry in lightly coloured due to the presence if dyes used due to its high polluting nature it is not possible to discharge if untreated. Industrialization has brought along with it the hazards of environmental pollution as it has the material comforts. This has gradually increased our concern about the unplanned side effects which may arise from releasing chemicals into our immediate surroundings. These chemicals form one of the major polluting sources which are discharged by industries without any care[5].

Water is the most abundant compound on Earth's surface, constituting about 70% of the planet's surface. In nature it exists in liquid, solid and gaseous states. It is in dynamic equilibrium between the liquid and gas states at standard temperature and pressure. A pollutant can be defined as a physical, chemical, radiological or biological parameter exceeding certain specified or tolerable limits characterizing the quality of an environmental component[6]. Agyara dam (Hans sarowar) is located at Alwar- Bharatpur Road at a distance of about 15 km. from Alwar City. The water of Agyara dam is spread over 20 hectare areas and depth of the Agyara dam is about 10 to 12 feet. The water colour of this dam has changed into light pink. At present, Alwar city is undergoing rapid urbanization and industrialization. MIA has many well-known industries (about 16 in table –I) vegetable oils, automobiles, casting units, detergents, cables, ceramics, minerals, chemicals, engineering, paper and beverages, chlorinated paraffin wax etc. The reason behind the deterioration of the water quality of this dam is the discharge of untreated or partially treated waste materials in the Dam and nearby villages. Agyara Dam which is situated at downstream of Matsya Industrial Area, is chosen for investigations to find out the effects of various industrial effluents on it. The ill effects of pollutants are also affecting people living nearby areas. Many villages are situated around this Dam.

REVIEW OF LITERATURE

Ground water quality changes are brought through man's introduction of foreign chemicals and biological materials into the subsurface environment through quantitative interference with natural flow pattern, by a completely natural process or through various combinations of these. Most ground and surface water contain some natural dissolved salts. These salts are most often, organic which are formed a from contact of the liquid water moving in the hydrological cycle with various rocks and soil minerals. Similarly, water can pick up natural organic matter from leaver grass and vegetation in various stages of biodegradations. As a result of these contact water accumulates various amount of natural impurities due to dissolution or chemical reaction followed by dissolution. Increases in population have increased the consumption of water and as more water being used more will be the domestic and industrial water[3].

Desai[7] and Ganguly in their paper "Man and toxic elements in the environment" gave statistical data related to daily intake of various elements essential drinking water by Indian adults, trace elements toxic to living beings and trace elements toxic to some life processes etc. Sharma et al. studied the ground water quality in and around industrial area of Jaipur. Rao et al. studied the ground water quality located in the proximity of Zinc smelter plant and observed that the TDS times greater than the WHO permissible limit. Sawant et al. found that the concentration of COD and Cadmium were 4-6 times higher that the permissible limit in the well water of district Dhule, (M.S.), having several industries like sugar, distillery, chemicals and dairies etc. They found that the concentration of copper and Zinc were about 19-20 times higher than the WHO permissible limit. Lokesh and Narayan found that the average nitrate concentration in dugwells during premonsoon and postmonsoon 13 mg/l and 19.7 mg/l respectively in Udupi municipal area. Kailash et al.[1] described a new defluoridation process named as KRASS, which differs from the known techniques for its simplicite cost effectiveness and results in traces of residual aluminium in treated water. R. Sivakumar et al.[8] carried out physico chemical analysis of water sources of Ooty, south India. Parameters included Total hardness, COD, chloride and heavy metals.

Comparisons were made with regulatory standard and mitigate measures are suggested to improve quality. According to them nitrate formed by biochemical activities of micro organisms or added in chemically synthesized from to lithozphere and biosphere, enter hydrosphere with relative ease as all these environmental components are dynamically inter connected. High solubility of nitrate in water and its low-retention by soil particles make it a major component of ground water in areas of high

nitrate formation. Nitrate enters the human body through the use of ground water for drinking and causes a number of health disorders namely, methemoglobinemia, gastric cancer, goitre, birth malformations, hypertension etc. when present in high concentrations in drinking water. Sudhir kumar et al.[6] in their paper "impact of textile industry on ground water quality of Sanganer, Jaipur" discussed ground water quality of Sanganer. The study was taken up to assess the quality of ground water to get an indication of contamination due to disposal of dye industry waste water and indiscriminate use of fertilizers with a view that study would serve as a base to involve suitable waste management strategy for the area. The parameters such as T.D.S, TH, alkalinity, fluoride, nitrate, chloride, sulphate, chromium iron etc[4]. significantly high, so according to them water should be treated before it is supplied to consumers. According to them in one village hardness, alkalinity, chloride and sodium are observed in high concentrations probably due to seepage of seawater into the ponds, so only after proper treatment if may be supplied for drinking and domestic use. Yadav, Jain and Lal (2003) have studied the determination of fluoride in drinking water taken at random from Behror and its suburbs with the help of ion selective electrode method. Pollution of water is an important aspect of environment pollution with the fast industrialization and urbanization in the world. The principal sources of contaminants of ground water quality are mining, petroleum processing, steel, smelter plants, pulp and paper, textile, agriculture industries etc[8, 12]. One the important effect is on public health as ground water is a major source of drinking water supply [7,8,11].

Mine dewatering by pumping of ground water can affect the quality of water withdrawn from wells in the surrounding area, for example, saline or poor quality water may appear in supply wells as a result of the modification of the ambient ground water flow pattern by pumping activities in the mine. When the quantity of these elements increases, they affect the human body system and cause detoriation of health. The major ions responsible to maintain the quality of ground water are carbonates, biocarbonates, chloride, sulphates, nitrate, phosphate and fluoride40. A lot of byproducts and wastages containing toxic heavy metals along with hazardous organic and inorganic effluents are discharged by industries on the land surface. These chemicals pollute the ground water through capillary action in the soil. Since the evaluation of chemical quality of ground water is an important aspect in its utilization aspect, the need for geochemical evaluation of ground water resources has gained considerable importance, as the area under investigation is deficit in surface water resources, and also experiences frequent serious water shortage owing to the vagaries of the monsoon.

Most fluorides are sparingly soluble and are present in natural water in small amounts. Acid mine water is produced in many cases when certain minerals (e.g copper pyrites) are exposed to atmosphere and as a result are oxidized. Few methods are available in literature where plants are used for defluoridation.

In the case of pyrites, sulphuric acid is released. Secondary reactions produce concentration of aluminum, manganese, calcium, sodium in coal mining areas and in metal mining areas, Copper, Lead, Zinc, Silver, Fluoride, Uranium, Antimony, Mercury, Chromium, Selenium, Cadmium, Arsenic have been found in mine waters in excessive concentrations. These metals are reported to cause highly deleterious effects on human and aquatic systems. Obviously, the determination of metals at trace and ultra-trace levels in water has assumed considerable significance in recent years in context of increasing environment pollution. All these elements can pollute the aquifer by the infiltration of polluted waters through mine excavations, or, ground water pollution may occur from the infiltration of pumped water as long as the mine is being operated and the water discharged to the surface without proper precautions.

PLANS OF PROPOSED WORK

1. Sampling- Groundwater samples will be collected from Agayara dam and nearby villages of different areas of Jhareda, Gundpur, Bagad Rajpoot, Agayara, Bahala. Groundwater samples will be taken from different depths and sources like bore well, hand pump etc. at different time-period (pre-monsoon, during monsoon and postmonsoon).

2. Analysis of Samples- Following parameters will be analyzed: pH, TDS, TH, BOD,COD and chloride, nitrate, fluoride, Magnesium, Calcium, total dissolved solid (T.D.S), total hardness (T.H.), Electric Conductance (EC) organic compounds(Phenols, paraffin's etc.), pesticides and metals Fe, Zn, As, etc.

3. Stastically data analysis - Findings data will be analysed Stastically by Water Quality index(WQI) standard method.

4. Comparatively Studies of findings Parameter -Findings data of water quality will be discussed for health problems and living organism of Dam.

METHODOLOGY

(1) Sampling of Water

The water samples will be collected during the three seasons (pre-monsoon, during monsoon and post-monsoon) throughout the year from Agyara Dam and nearby village's screw-capped polyethylene bottles.

(2) Analysis of Samples

To analyze the water samples for different parameters, the following standard methods will be used-

1. Digital Portable Water Analyzer will be used for the determination of pH, Electrical Conductivity and TDS.
2. UV Spectrophotometric and fluoride ion selective methods will be used for the detection of F^- and NO_3^-, SO_4^{-2}
3. Complexo metrically method will be used for the determination of Ca^{2+}, Mg^{2+}.
4. Volumetrically will be used for the determination of Cl^- and TH.
5. Flame Photometric and other methods will be used for the analysis of Na^+ and K^+.
6. As, Zn, Fe, metals will be analyses by using Atomic Absorption Spectrophotometer.
7. BOD will be determined by dilution method.
8. COD will be determined by titrimetric method.

(3) Stastically data analysis

To determine the suitability of water for living organism in Dam and agriculture, an indexing system, Water Quality Index (WQI) will be used[2].

(4) Comparative Studies of Findings parameters

Comparative Study of finding data of water samples will be carried out with bar diagram and graphical techniques etc. Findings data of water quality will be discussed for health problems, agriculture and living organism of Dam.

FEASIBILITY OF WORK

The practical work for analyzing the collected samples will be done at R. R. College, Department Chemistry, Alwar, Water Analysis Lab, Ground Water Department, Jaipur and Geological Survey of India, Chemical Block, Jhalana Dungri, Jaipur

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