International Research Journal of Natural and Applied Sciences
Vol. 4, Issue 5, May 2017 Impact Factor- 5.46
ISSN: (2349-4077)
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PHYSICO-CHEMICAL AND BACTERIOLOGICAL ANALYSIS OF SOIL AND WATER SAMPLE OF INDUSTRIAL AREA – GAJRAOULA

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ABSTRACT

The present study aims to manage the Physicochemical and Bacteriological examination of water and soil tests gathered from industrial area of Gajroula (District- Amroha), Uttar Pradesh, India. All physico-chemical tests were conducted in the month January 2017. Studies were done to check the nature of water; regardless of whether it is suitable for drinking purpose or not. Physicochemical and microbial examinations of water tests utilizing standard techniques were performed. We also take a look at the form of soil found there alongside its physicochemical residences and characterize the different microorganism found in soil.

Keywords- Physico-chemical analysis, Bacteriological examination, Industrial area, soil, analysis, water analysis.

Introduction

Soil is composed of minerals, soil natural matter, water, and air. The organization and extent of these segments significantly impact soil physical properties like including shape and pore. These properties impact air and water developments in soil, and in this manner the capacity of soil to work. Water is the one of the vital supply of lifestyles on the planet [1]. It additionally performs exceptional and essential exercises in earth biological system, biosphere and biogeochemical cycles1.In this way, great water is dependably a need for living life forms. Faucal contamination of drinking water causes water conceived infection which has prompted the passing of a large number of people3-5. In a perfect world consuming water should not contain any microorganisms regarded to be pathogenic or any microorganism indicative of faucal pollution.[3] Probably the most important pathogenic microorganism transmitted by the water path are Salmonella typhi, the organism causing typhoid fever, and Vibrio cholerae, the organism causing cholera. Soil

microorganisms additionally influence above-ground ecosystems by using contributing to plant vitamins, plant fitness, soil structure, and soil fertility. [4]

Over the foremost recent 3 decades, the quick development of industry and urbanization has created negative impacts on the world attributable to mechanical, civil what is additional, farming squanders containing pesticides, bug sprays, manures buildups and overwhelming metals. a number of enterprises square measure being builds up step by step attributable to meet the complicated the necessity of fast developing urbanization, consumerization and increment the request of item within the gift day [7].

In present day industrialization period, the greater part of water assets have influenced massively by leakage, draining and blending of mechanical effluents in a large portion of the metropolitan urban communities and mechanical townships. Gajraula, being an unmistakable mechanical territory of western Uttar Pradesh, owes its noteworthiness to different gathering of ventures, which incorporates expansive refinery and its related substance units, paper, phosphate compost plant, materials, pharmaceuticals, dairy and different units. The mechanical effluents contain lethal chemicals, dangerous mixes, suspended solids and nonbiodegradable materials. The significant wellspring of surface and ground water contamination is unwise release of untreated mechanical effluents straightforwardly into the surface water bodies bringing about surface and ground water contamination [8] For most communities the most secure source of safe drinking water is pipe-borne water from municipal water treatment plants. Often, most of water treatment facilities don't deliver or fail to satisfy the water needs of the served community because of corruption, lack of maintenance or exaggerated population. The scarcity of piped water has made communities to find alternative sources of water hence ground water sources has been a ready source [12]

The effluents from the ventures and sewage of modern towns have depleted all things considered through a neighborhood deplete known as Bagadnallah, which accept the state of occasional waterway,

Particularly amid storm [9].The ground water nature of chose four town found around modern territory have been influenced a considerable measure and causes genuine infection among the individuals and other domesticated animals populace. The modern effluents if not treated legitimately controlled, can contaminate and cause genuine harm to the ground water assets.[4].

Water quality file (WQI) has given an evaluation of water quality patterns for administration reason even in spite of the fact that it is not implied particularly as a flat out measure of the level of contamination or the real water quality (Mysterious, 1997). WQI is computed from the purpose of perspective of the appropriateness of ground water for human utilization [3]

Fresh water is confined useful element/treasured deliver, extraordinarily critical for farm-related, enterprise and even human lifestyles, without sparkling water of (desirable) enough amount, (able to final/assisting the planet) development wills now not viable [12]. Since water first-rate and human health is intently related, water analysis earlier than usage is of maximum essential significance. Certain bodily, chemical and microbiological standards, which can be designed to make certain that the water is suitable to devour (or to believe) and secure for ingesting earlier than it could be described as drinkable [2] Physicochemical property like pH for water must be in the variety of 6.5 to eight.5 for ingesting and home functions. As a totally vital position of DO amount in water best of floor water, the common attention of DO become maximum in publish terrible rainstorm duration and lowest in terrible rainstorm as a result increase in BOD and COD.The limits/hints like pH, (mixed with and have become part of a liquid) oxygen(DO),biological oxygen call for(BOD),chemical oxygen call for(COD) total hardness(TH),calcium and magnesium have been analysed the use of trendy techniques [4,5].

Study area and its Location

Gajraula city is around 115 Km. far from Delhi on national interstate NH-24, Delhi-Lucknow road. Gajraula is outstanding and one of the most seasoned modern region of region Amroha (Uttar Pradesh) arranged on globe at a longitude 78° 13'48.75" E and scope 28° 50'59.26" N at 679 feet above ocean level (207 msl).Gajraula modern region around 6.0 - 11.5 km covering surface region was chosen on the premise of presence of huge number of enterprises (compound units, mash and paper, phosphate compost plant, materials, pharmaceuticals, dairy items handling units and others), which release a tremendous measure of wastewater as blended effluents through various channels into a regular stream.

Materials and methods

Sample collection: Water samples were collected by Clutch sampling method from hand pumps having the water table at depth of 120 feet, from sampling sites selected at two places located nearby Gajraula industrial area namely, Kavi Nagar and Shahbazpurdor. For water sampling the method followed is as per the Guideline given by Indian standard IS: 3025.For soil sampling the method followed is as per the protocol described by Indian standard IS: 2720. Soil samples have

been taken (approx. 100g) In easy, dry and sterile poly beg, the usage of sterilized spatula and water sample were amassed in 50ml sterilized falcon tubes, lowering the chances of infection as some distance as possible, and were carried to the laboratory and stored in fridge for in further analysis.

Fig.1. Map of Uttar Pradesh

Fig.2. Map of Amroha District

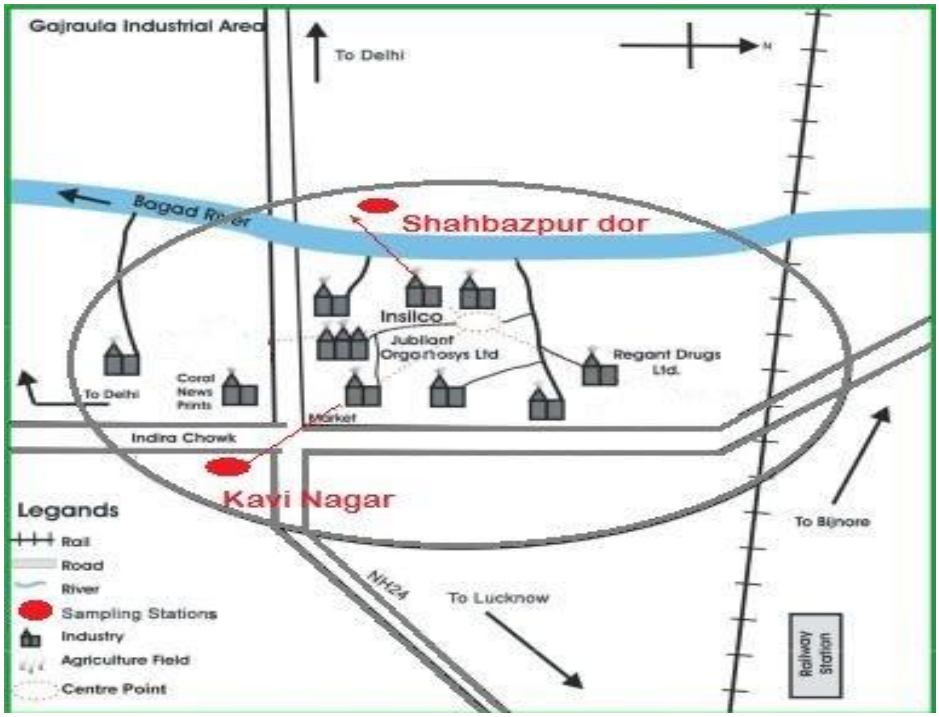


Fig.3. Showing sampling site at Gajraula Industrial area

Physico-chemical parameters: All the chemicals used were AR grade of quality. Double distilled water was used for the preparation of all the reagents and solutions. Glassware's were cleaned with HCl followed by distilled water. The physico-chemical parameters such as pH, Conductivity, Dissolved Oxygen (DO), Total dissolved solids (TDS), Total suspended solids (TSS), Biochemical Oxygen Demand (BOD) and Chemical oxygen demand (COD) were determined using standard method. Methods used for estimation of various parameters are shown in Table 1.Biochemical assay such as Gram Staining, Catalase Test, Methyl red Test, Urease Test, Citrate Test, Indole Test, and Oxidase Test.

Table 1: Methods Used For Estimation of Various Parameters

Sr.No.	***Parameter***	***Methods***
1	pH	pH Metrically
2	Electrical Conductance	Conductometrically
3	Chemical oxygen demand (COD)	Titration Method
4	Dissolved Oxygen (DO)	Winkler Method
5	Total dissolved solids (TDS)	Gravimetrically
6	Biochemical Oxygen Demand (BOD)	Titration Method

Bacteriological Analysis: Bacteriological traits have been decided as defined by means of Bezuidenhout et al., (2002). Nutrient agar (NA), Salmonella- shigella agar, Thiosulphate citrate bile salt sucrose agar changed into used to decide heterotrophic bacterial, Salmonella and Shigella,

Vibrio cholerae respectively. All plates had been incubated at 35o C for 24hrs. Presumptive colonies had been showed through gram staining.

Statistical analysis: All the experiments were performed thrice in repetition with every treatment consisting of 12 replicates. The mean data of three experiments were analyzed with the help of Microsoft Office Excel 2016 for data of a completely randomized design. The various parameters recorded during the study were subjected to one and two way analysis of variance (ANOVA).

Results and discussion

The present studies demonstrated that the amount is the worthy ground water nature of hand pumps. The consequences of physico-substance qualities of ground water and soil sample are introduced in Table-2-3. pH is most imperative in deciding the destructive way of water. pH of soil test was observed to be in the range from 6.33 to 6.46 and for water 7.02 to 7.14 and both the water sample analyzed have concentration within in safe limit of 6.5 to 8.5 standard set by WHO.[12] Thus it will not cause any harmful effect to the consumers. The assurance of EC and TDS were done to know the degree of mineralisation of ground water in the review range. The EC estimation of gathered water tests i.e. Kavinagar is 1.66 ×10-3 μS at 25^{o}C with TDS 82 mg/ml, shahbazpurdor is 1.72 ×10-3 μS at 25^{o}C with TDS 37 mg/ml. However, all the values were within the standard limit of WHO (500mg/l) as shown in Table. 3. The significant hazard to human wellbeing is fecal pollution of water supplies. Groundwater are observed to be tainted because of despicable development, shallowness, creature squanders, vicinity to latrine offices, sewage, reject dump locales, and different human exercises around the well [13]. Water quality can be resolved utilizing diverse physical, concoction and natural parameters; they are extremely helpful to assess contamination patterns [14]

The DO estimation of collected water for Kavinagar is 8.53 mg/l, Shahbazpurdor is 7.33 mg/ml which are acceptable when compared to WHO standard. The COD estimation of collected water tests i.e

kavinagar is 13.5, shahbazpurdor is 15.6 .the hig rang of cod is due to direct discharge of untreated waste in to ground or on land was responsible for high COD and BOD. However, it found to the permissible limit of WHO and fit for irrigation purpose The basic principle of Gram staining is the properties of certain bacteria cell walls to retain the crystal violet dye. The cell walls for Gram-positive microorganisms have a higher peptidoglycan and lower lipid content than Gram-negative bacteria [11]. i.e Gram-negative were found in both location (Fig.5).

The bacteria isolate from both location of water in work included *Escherichia coli, Enterbacter aerogenes, Pseudomonas spp, Staphylococcus aureus, Salmonella typhos.(Table 5) with Salmonella typhhosa and Enterobacter aerogenes* not isolated from both sample .i.e. kavi nagar and shahbazpur dor

The catalyst catalase intercedes the breakdown of hydrogen peroxide into oxygen and water. The nearness of the chemical in a bacterial detach is obvious when a little inoculum is brought into hydrogen peroxide, and the quick elaboration of oxygen air pockets occurs. Catalase-positive microscopic organisms incorporate strict aerobes and also facultative anaerobes. They all can breathe utilizing oxygen as a terminal electron acceptor. Catalase-negative microorganisms might be anaerobes, or they might be facultative anaerobes that exclusive mature and don't breathe utilizing oxygen as a terminal electron acceptor (ie. Streptococci)

The oxidase test is utilized to recognize microbes that deliver cytochrome c oxidase, a chemical of the bacterial electron transport chain. Whenever introduce, the cytochrome c oxidase oxidizes the reagent (tetramethyl-p-phenylenediamine) to (indophenols) purple shading final result. At the point when the compound is absent, the reagent stays decreased and is colorless. i.e. we have found the negative result in both location kavinagar as well as shahbazpur dor. After the addition of methyl red the coloration of the culture media change to yellow coloration which concluded that the isolated bacteria is MR poor and In this indole test there's no sign of formation of any red or red color ring at the top of the media, so from which it's far concluded that the isolated bacteria is Indole negative (Table 6).

Table 2. Different physico-chemical parameters of soil

Location	pH	% of Organic matter	% of CaCO3	% of moisture content
Kavinagar	6.33	1.3122±0.50	17.01	11.72
Shahbazpurdor	6.66	0.5471±0.45	18.02	14.20

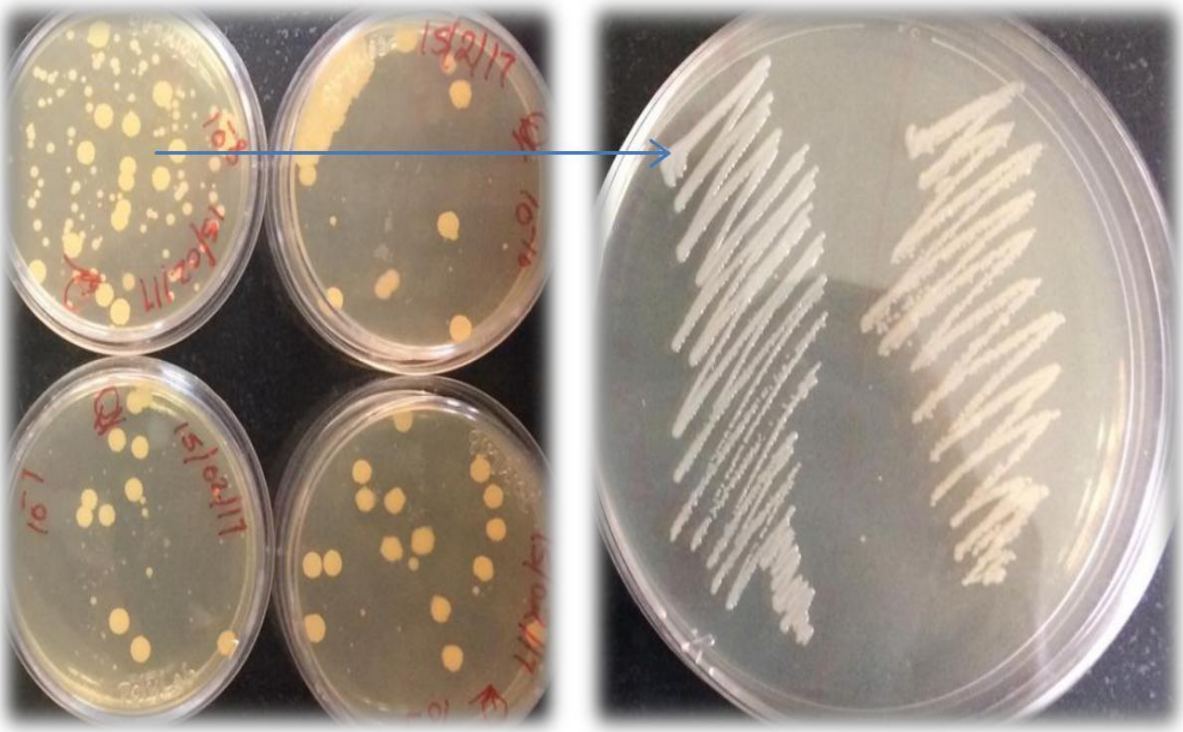
± S. E

Table 3. Different physico-chemical parameters of Water

Parameter	Units	WHO Standards	Water samples	
			Kavi nagar	Shahbazpur dor
pH	-	6.5-8.5	6.33	7.02
EC	µS	NS	1.66 ×10-3	1.72x10-3
TDS	mg/l	500	82	37
TSS	mg/l	NS	76	32
Dissolved Oxygen	mg/l	500	8.53	7.33
COD	mg/l	10	13.5	15.6
BOD	mg/l	5	8.5	9.3

Cl	mg/l	250	142.54	132.25
Na	mg/l	200	112.52	130.52
K	mg/l	NS	10.23	11.32

Fig. 4. Bacterial enumeration Pure culture isolated by streak plate method



Dilutions **10-8**

Fig. 5 Gram-negative bacteria were identified in staining

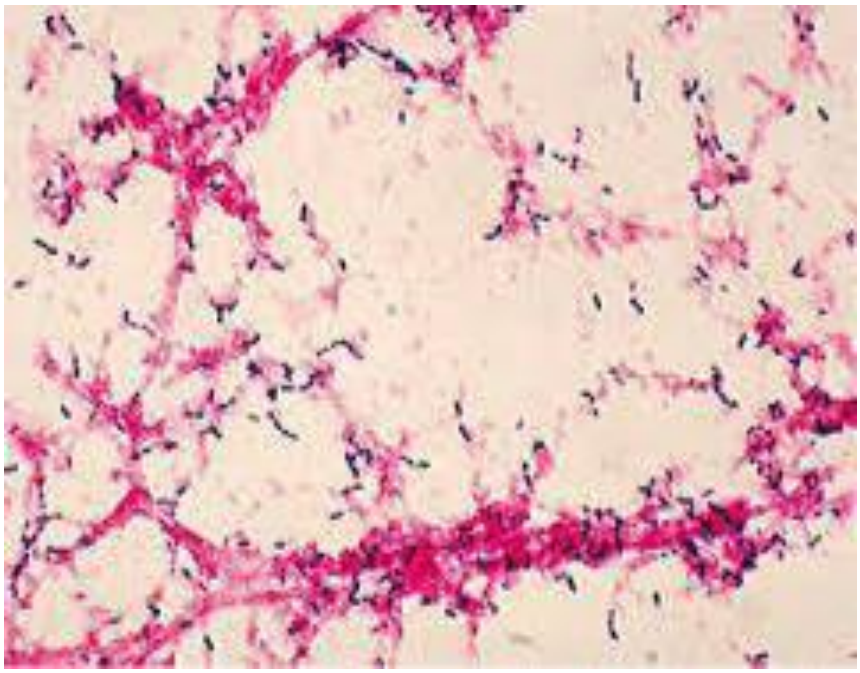


Table 6: Results of Different Biochemical Test

Sr. No	List of Biochemical Test	Result
1	Gram Staining	Negative
2	Shape	Uniformly Bacilli
3	Catalase Test	Positive
4	Methyl red Test	Negative
5	Urease Test	Positive
6	Citrate Test	Positive
7	Indole Test	Negative
8	Oxidase Test	Negative

Table 7: Comparision Between Enterobacter spp. And Unknown Bacteria isolated

Sr. No	List of Biochemical Test	*Enterobacterspp*	Result
1	Gram Staining	Negative	Negative
2	Shape	Uniformly Bacilli	Uniformly Bacilli
3	Catalase Test	Positive	Positive
4	Methyl Red Test	Negative	Negative
5	Urease Test	Positive	Positive
6	Citrate Test	Positive	Positive
7	Indole Test	Negative	Negative
8	Oxidase Test	Negative	Negative

CONCLUSION

Physicochemical properties of water and soil tests gathered from Industrial area Gajroula, kavinagar and Shahbazpurdor of Amroha district locale have been exhibited. Every one of the parameters for each dirt example and water tests resulted inside the allowable range. The dirt pH is marginally acidic or somewhat antacid which is ideal for the farming perspective. The water pH is additionally inside the scope of 6.5 to 7.5 which shows that it can be utilized as drinking water. The dirt was observed to be Soil sort and dark in shading. The microbial reviews can be used for the avoidance of any pathogenic illnesses brought about by the organisms found in soil and water. Consistent examination of the amphibian life can help in keeping up environmental adjust. The investigation of soil surface can be useful for the agriculturists in their water system and vegetation reason.

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