



**International Journal of Biology, Pharmacy
and Allied Sciences (IJBPAS)**

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

**A REVIEW OF ASSESSMENT OF SOME PHYSICO-CHEMICAL
PROPERTIES AND BACTERIOLOGICAL STATUS OF INDUSTRIAL
WATER AND WASTEWATER**

**PATEL M¹, UPADHAYAY D², MARCHAWALA F², BHATTACHARYA I² AND
ANDHARE P^{2*}**

1: Student, M. Sc. Microbiology, Parul Institute of Applied Sciences, Parul University, Post
Limda, Waghodia, Gujarat, 391760

2: Assistant Professor, Parul Institute of Applied Sciences, Parul University, Post Limda,
Waghodia, Gujarat, 391760

***Corresponding Author: E Mail: Dr. Prasad Andhare: prasad.andhare82145@paruluniversity.ac.in; Tel:
+918200614350**

Received 19th Jan. 2021; Revised 20th Feb. 2021; Accepted 19th March 2021; Available online 1st April 2021

<https://doi.org/10.31032/IJBPAS/2021/10.4.1010>

ABSTRACT

Protease is an inexpensively significant enzyme that is being used in a lot of food industries, pharmaceuticals and manufacturing industry. As protease has heavy demand commercially, its production reaps riches. Since, milk and milk products hold major amount of casein, bacteria isolated as of the dairy effluents are predictable to produce more protease enzyme. *Bacillus subtilis* was second-hand as the control. It was established that *Pseudomonas* species were stronger in protease production than the other isolated bacterial strains and the control. People on sphere are under tremendous danger due to undesired change in the characteristics of air, water and soil. Water is one of the particularly important requirements of all living being. Water occupies about 70% of the earths outside and provides essential elements, when impure it may turn out to be dangerous to human's health. Many communicable diseases are transmitting by water through the fecal-oral route. Humans need water in a lot of daily activities like drinking,

washing, bathing, cooking etc. The excellence of water habitually describes according to its physical, chemical and biological characteristics. From the review it was observed that chemical and physical contamination of water is not less significant but the deadly pollutants present in drinking water are of biological source.

Keywords: Protease, *Bacillus subtilis*, *Pseudomonas* species, Pharmaceutical, water quality, pollution, infectious diseases, physico-chemical assessment, bacteriological assessment

INTRODUCTION

Out of the total quantity of global irrigate, only 2.4% is dispersed on the mainland, of which simply a small portion can be utilize as fresh water. The on hand fresh water is barely 0.3-0.5% of the total water obtainable on the Earth. Land water, surface water (rivers, streams and ponds), impressive water (rainwater, snow and hail) and spring are the main source of water to be had to the people in general. The individuality of these water bodies varies widely depending on the location and environmental factors [1-3]. Even if, water is endlessly clean by evaporation and precipitation, it is impure with raw sewage and industrial effluents on earth exterior and hence water contamination has emerged as one of the most important environmental harms. The causes of such worsening are mainly originated from urbanization, industrialization, undeveloped movement and an increase in human inhabitants for the past one-half century. One hundred years previously, the most important water infectivity problems were fecal and

organic toxic waste from untreated person waste and the by-products of industry [4, 5].

TYPES OF CONTAMINANTS

Toxins that strength be experience in developed conditions incorporate designing profluent and created squanders (E.g.:- Hexachlorobenzene, HCB), leach ate produce from landfills, reserves, graveyard or sullied soils, supplements and salts as of Sewage treatment plant and waste matter from water system conduct, hydrocarbons spill from incendiary stockpiling tanks, synthetic substances and microorganisms from release underground pipelines and sewers, composts and pesticides, sharp waters and raised metal fixation from the disturbance of corrosive sulfate soils in seaside regions, supplements and salts from broad homegrown wastewater water system, and holes of store natural synthetic mixtures second-hand in assembling or beneficial cycles [10]. The rate and groupings of toxins that might be set up in water will differ contingent upon the powerlessness of the

water conspire, the area and nature of the poison source, actual characteristic of the synthetics or accumulate, home season of the pollutants in the dirt or water, and pressure driven uniqueness of the spring [4].

Physico-compound Parameters

It is essential and important to test the water past to it is utilized for drinking, homegrown, horticultural or modern explanation. Water should be knowledgeable about dissimilar physico-substance boundaries. Collection of boundaries for testing of water is solely depends on winning for what reason withdrawing to utilize that water and what amount call for of its quality and immaculateness. Water does happy dissimilar kinds of adjusted, broke up, ready just as microbiological contamination [9]. Some actual test should be performed for testing of its physical show up like temperature, shading, scent, pH, turbidity, TDS and so on while substance tests ought to be do for its BOD, COD, broken down oxygen (DO), alkalinity, hardness and other text style. For acquire extra and extra quality and virtue water, it ought to be capable for its draw metal, substantial metal inside and characteristic for example pesticide buildup. Unmistakably drinking water should finish these entire assessments and it should content essential measure of mineral stature. Because

of amazingly low mindfulness of weighty metal and natural creepy crawly executioner debasements present in water it needs very muddled insightful instrument and all-around prepared labor. Next various physico-synthetic boundary is tried regularly for screen nature of inundate [7].

Carbon Dioxide

Carbon dioxide is the conclusion manufactured merchandise of natural carbon feebleness in practically all marine conditions and its error is again and again a process of net organization digestion [11]. Thus, in marine biogeochemical examines, it is satisfying to measure boundaries that describe the carbon dioxide system. CO₂ is additionally the main greenhouse gas on ground Its flux diagonally the air-water or silt water limit are amidst the main worries in worldwidealterstudy and are frequently a figure of the net bionetwork creation/digestion of the water framework [11]. There is a grouping of gamely quantifiable boundaries of sea-going carbon dioxide association: like pH (pCO₂), absolute disintegrated inert carbon (DIC) and complete alkalinity (TA). Surface water pCO₂ can be exact by photometric technique [9]. And DIC CO₂ is considered by coulometer or by an infrared CO₂ analyzer. Total Alkalinity CO₂ is faithful by HCl

titration of the water representation to the CO₂ equality point [8].

Temperature

In a standard framework the water temperature controls the pace of all substance response, likewise it influences development, generation and different attributes of marine life. Exceptional warmth changes can be harming and occasionally lead to destructive of sea-going life.

Disintegrated Oxygen

DO is perhaps the main boundary. Its relationship with water body gives direct and circumlocutory in succession E.g.: - bacterial movement, photosynthesis, accessibility of supplements, delineation and so forth [12]. In the improvement of summer, broken down oxygen diminished because of expand in temperature and furthermore because of more noteworthy than before microbial development. For the degree of summer, the long days and profound daylight appear to speed up photosynthesis by phytoplankton, use CO₂ and giving foul oxygen. This maybe represents the superior individuality of O₂ recorded for the time of summer [14]. DO in example is purposeful titrimetrically by Winkler's framework following 5 days hatching. The separation in unique and last DO gives the amount of oxygen eager by the microbes for the span of this period. This

usual methodology needs exceptional BOD bottles which seal the in the inside climate beginning environmental oxygen.

Electrical Conductivity

Conductivity showoff no consequence corresponding with ten boundaries like temperature, pH esteem, alkalinity, complete hardness, calcium, absolute solids, all out disintegrated solids, synthetic oxygen interest, chloride and iron exceptional treatment of water [13]. It is conscious with the help of EC meter which techniques the obstruction realistic by the water between two Platonized cathodes.

Alkalinity

It is self-possessed first and first of carbonate and bicarbonate; alkalinity goes about as an additive for pH. Alkalinity, pH and hardness affect the poisonousness of numerous substances in the water.

pH

pH is almost everyone essential in developmental the mocking idea of water. Subordinate the pH worth higher is the biting natural universe of water. pH was emphatically interrelated with electrical conductance and absolute alkalinity [10]. The concentrated speed of photosynthetic development the consolidation of carbon dioxide and bicarbonates which are at last liable for expansion in pH, the low oxygen

esteems concurred with high temperature all through the late spring month. A grouping of components brings concerning change the pH of water. The higher pH standard trial proposes that carbon dioxide, carbonate bicarbonate harmony is valuable strengthening because of progress in physico-substance condition [15].

Biochemical Oxygen Demand (BOD)

Body is an assess of natural pieces and pieces pollution in water, individual in mg/L. Body is the amount of broke up oxygen compulsory for the biochemical deterioration of natural compound and the oxidation of uncertain inorganic materials (e.g., iron, sulfites). Uniquely the test for BOD is direct over a five-day recess [7].

Chemical Oxygen Demand (COD)

COD is an additional gauge of natural material virus in water individual in mg/L. COD is the amount of broke down oxygen needed to ground synthetic oxidation of the natural texture in water. Both BOD and COD are input indicator of the natural state of being of the water.

Magnesium

It is additionally intentional by complex metric titration with standard arrangement of EDTA utilizing Ferrochrome dark T as pointer underneath the safeguard environmental factors of pH 10.0. The

cushion clarification is finished from Ammonium Chloride and Ammonium Hydroxide. The clarification opposes the pH varieties during titration. Sodium It is cautious with the be of help of blast photometer. The apparatus is normalized with the known mindfulness of sodium answer (1 to 100 mg/L).

Silicates and Phosphate

These are likewise conscious spectroscopically. Yellow tone is urbanized from the accomplishment of phosphates and silicates on molybdate particle under durable acidic conditions. The significance of shading is unswervingly near to the reflection of phosphate and silicates in the example. Phosphate complex are modest by powerless tumbling specialists, for example, ascorbic corrosive or tartaric corrosive anyplace as silica edifices have need of solid lessening environmental factors of hydrazine or bisulphate.

Calcium

It is purposeful by complex metric titration with trademark clarification of EDTA through Patton's and Reeder's pointer under the pH conditions of more than 12.0. These conditions are accomplished by adding up to a fixed volume of 4N Sodium Hydroxide. The limit of titre(EDTA arrangement) lined

up with the known measure of test give the convergence of calcium in the portrayal [6].

Carbonate

At what in the world time the pH contacts 8.3, the being there of carbonates is demonstrate. It is unhurried by titration with homogeneous hydrochloric corrosive utilizing phenolphthalein as check. Under pH 8.3, the carbonates are changed into comparable number of bicarbonates. The titration should likewise be possible pH on schedule or potentiometrically.

Nitrogen

It is considered spectroscopic ally at 425 nm outflow by make a colour difficult with Nessler's reagent. The conditions of reply are soluble and cause determined obstruction from rigidity in water [6].

Chloride

It is planned by titrating a notorious quantity of photo with generally a similar silver nitrate explanation by methods for potassium chromate explanation in hose down or fluorescein arrangement in liquor as meter [13].

Potassium

It is intentional with the help of fire photometer. The mechanical assembly is normalized with perceived centralization of potassium arrangement (1 to 100 mg/L).

Bacteriological water Quality Parameters

Water bodies as a rule comprise of a broad diversity of microorganisms, some of which are pathogenic and several which are not. An amount of the non-pathogenic microorganisms perhaps will prompt damages in water supplies, for example, unsavory taste and smell which may pass out as pointer of safety. The important uneasiness for microbiological prevalence of water, then again, is the capability of pollution by microorganisms. Such pathogenic impurities include microorganisms, helminths, protozoa and infections and most of these living beings are coming about because of excrement [1]. Pointer creatures, as general rule microorganisms, are just about second-hand to investigate the microbiological prevalence of water. in such markers the almost everybody as often as possible ones are thermo tolerant (fecal) coliforms or *E. coli*. In adding together to the higher than referenced pointers of bacteriological water predominance, the more extensive gatherings of coliforms recognized as absolute coliforms are furthermore second-hand in observing agenda[2]. Similarly, as with sterile assessment, information on microbiological water greatness may be partitioned into various class and the degrees of pollution

combined with every classification should be chosen dependent on nearby conditions [17].

Total Coliform

Coliform microscopic organisms are metabolically undefined as oxygen consuming or facultative anaerobic bacilli, gram-negative, oxidize-negative, non-spore forming pole molded microorganisms and can deliver in a medium contain bile salts with the assembling of corrosive, gas and aldehyde following maturing lactose at a most ideal temperature of 35°C inside 24 to 48 hours [2].

Thermotolerant Coliform Bacteria

Thermotolerant coliform includes microorganisms of the variety *Escherichia*, and less significantly, *Enterobacter*, and *Citrobacter*. They are particular as a gathering of coliform organic entities that are skilled to commotion lactose at 44°C to 45°C. now and again, this assortment is additionally call fecal coliform (FC) to state coliforms of fecal deduction. This isn't appropriate since thermotolerant coliforms extra than fecal coliforms may to start from in nature enhanced water such in light of the fact that modern effluents, from disintegrating plant materials and soils or on vegetation in a hot tropical timberland. Out of these creatures, just *E. coli* is especially of fecal deduction [17]. Then again, centralization of

thermotolerant coliforms is as a general rule straightforwardly identified with that of *E. coli* and along these lines can be second-hand as a proxy test for *E. coli*.

Fecal Streptococci and Enterococci

The articulation fecal streptococci contain be worn to show a gathering of systematically far eliminated from streptococci with the meaning of are gram-positive, catalase-negative, non-spore-framing, facultative anaerobes recoverable from the gastrointestinal plot of people and creatures. This gathering has been thoroughly examined as a pointer of fecal tainting in ecological waters. They are available in nearly high thickness in human and creature excrement, in sewage, and it is for the most part accepted that they don't develop and increment in natural waters and soils [1].

Escherichia coli

Escherichia coli are an exact separation of the thermotolerant coliform microscopic organisms which appreciate the compounds β -galactosidase and β -glucuronidase that hydrolyzes 4-methyl-umbelliferyl- β -Dglucuronide. They are set up bounteously in defecation of people and warm-blooded vegetation. 95% of every single one coliform set up in human defecation can be *E. coli*. [3].

Heterotrophic Plate Count

These assortments include gram-negative microscopic organisms be in the perfect spot to the ensuing genera: *Pseudomonas*, *Aeromonas*, *Klebsiella*, *Enterobacter*, *Citrobacter*, *Serratia*, *Acinetobacter*, *Proteus*, *Alcaligenes*, and *Moraxella*. A few individuals from this assortment are crafty microbes yet little is reported in regards with the impacts of high quantities of HPC microorganisms on human wellbeing [13]. Heterotrophic plate tally is viable to water treatment plant administrators through respect to evaluate the great association of different direct cycles just as sanitization in a water treatment plant, observing the bacteriological nature of the total water during capacity and giving out, deciding bacterial development on surfaces of assets utilized in treatment and circulation frameworks and deciding the inert for regret or resulting to development in treated water in allotment framework [10].

Clostridium perfringens

Clostridia are usually shrewd microbes but at the same time are worried in human illness, for example, gas gangrene (*C.perfringens*), lockjaw (*C.tetani*), botulism (*C.botulinum*), or intense colitis (*C. difficile*). Clostridium perfringens is an anaerobic gram-positive, endospore-forming, bar formed, and Sulfite-lessening bacterium found in the colon and

address in the district of 0.5 percent of the fecal micro flora. It produces spores that are very impervious to ecological burdens and to sterilization. taking into account the way that it is a partner of the Sulfite diminishing clostridia (SRC) bunch, it is recognized in development media contain Sulfite.

CONCLUSION

From the review it was observed that chemical and physical contamination of water is not less significant but the deadly pollutants present in drinking water are of biological source.

ACKNOWLEDGEMENT

It is our privilege and honour to express our sincerest gratitude to the Parul University, Vadodara, Gujarat for providing me all the necessary support and facilities including state of the art infrastructural facilities with advanced technological scientific laboratories and everything else that was required to carry out this work.

REFERENCES

- [1] Amira AA, Yassir ME (2011). Bacteriological quality of drinking water in Nyala, South Darfur, Sudan. Environ. Monit. Assess, 175: 37–43.
- [2] Adefemi S. O. and E. E. Awokunmi, (2010), Determination of physico-chemical parameters and heavy metals in water samples from

-
- Itaogbolu area of Ondo-State, Nigeria, *African Journal of Environmental Science and Technology*, 4(3), pp 145-148.
- [3] Adnan, Amin, Taufeeq, Ahmad, Malik, Ehsanullah, Irfanullah, Muhammad, Masror, Khatak and Muhammad, Ayaz, Khan, (2010), Mengesha et al., 2004, Evaluation of industrial and city effluent quality using physicochemical and biological parameters, *Electronic Journal of Environmental, Agricultural and Food Chemistry*, 9(5), pp 931-939.
- [4] Agarwal, Animesh and Manish, Saxena, (2011), Assessment of pollution by Physicochemical Water Parameters Using Regression Analysis: A Case Study of Gagan River at Moradabad- India, *Advances in Applied Science Research*, 2(2), pp 185 -189.
- [5] Basavaraja, Simpi, S. M., Hiremath, K. N. S. Murthy, K. N. Chandrashekarappa, Anil N. Patel, E.T.Puttiah, (2011), Analysis of Water Quality Using Physico-Chemical Parameters Hosahalli Tank in Shimoga District, Karnataka, India, *Global Journal of Science Frontier, Research*, 1(3), pp 31-34.
- [6] Cheesbrough M (2006). *District Laboratory Practice in Tropical Countries*, Part 2 Second Edition. Cambridge University, pp. 149-154.
- [7] Chavan, R. P., Lokhande, R. S., Rajput, S. I., (2005), Monitoring of organic pollutants in Thane creek water, *Nature Environment and Pollution Technology*, 4(4), pp 633-636.
- [8] Dickson, A. and Goyet, C, (1994), *DOE Handbook of Methods for the Analysis of the Various Parameters of the Carbon Dioxide System in Sea Water*, Version 2.
- [9] Dey, Kallol, Mohapatra, S. C., Misra, Bidyabati, (2005), Assessment of water quality parameters of the river Brahmani at Rourkela, *Journal of Industrial Pollution Control*, 21(2), 265-270.
- [10] Gupta, D. P., Sunita and J. P. Saharan, (2009), Physiochemical Analysis of Ground Water of Selected Area of Kaithal City (Haryana) India, *Researcher*, 1(2), pp 1-5.
- [11] Hopkinson, C.S, (1985), Shallow-water and pelagic metabolism: Evidence of heterotrophy in the
-

-
-
- near-shore Georgia Bight, Marine Biology, 87, pp 19.
- [12] Haruna R, Ejobi F, Kabagambe EK (2005) PremlataVikal, 2009. The quality of water from protected springs in Katwe and Kisenyi parishes, Kampala city, Uganda. Afr. Health Sci., 5(1): 14-20.
- [13] Jena, P. K., Mohanty, M, (2005), Processing of liquid effluents of mineral processing industries, Intl Symposium Environ Manage Mining Metallurgical Industries, 11-14 , Bhubaneshwar, pp 193- 212.
- [14] Kataria, H. C., Quershi, H. A., Iqbal, S. A. and Shandilya, A. K, (1996), Assessment of water quality of Kolar reservoir in Bhopal (M.P.). Pollution Research. 15(2), pp 191-193.
- [15] Karanth, K. R, (1987), Groundwater Assessment Development and Management Tata McGraw Hill publishing company Ltd., New Delhi, pp 725-726.
- [16] Krishnamurthy, R., (1990), Hydrobiological studies of Wohar reservoir Aurangabad (Maharashtra State) India, Journal of Environmental Biology, 11(3), 335-343.
- [17] (WHO, 2003), (WHO, 2008).