IARJSET ISSN (O) 2393-8021, ISSN (P) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology

ISO 3297:2007 Certified ⁜ Impact Factor 8.066 ⁜ Peer-reviewed / Refereed journal ⁜ Vol. 10, Issue 6, June 2023

DOI: 10.17148/IARJSET.2023.10633

"REVIEW PAPER ON THE ROLE OF PH IN WATER QUALITY IMPLICATIONS FOR AQUATIC LIFE, HUMAN HEALTH, AND ENVIRONMENTAL SUSTAINABILITY."

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Abstract: pH is a crucial parameter for assessing water quality due to its impact on the chemical and biological processes that occur in water bodies. The pH of water can be influenced by natural and human-made factors, including atmospheric deposition, industrial activities, and agricultural practices. This paper explores the role of pH in water quality and its implications for aquatic life, human health, and environmental sustainability. Changes in pH can affect the solubility and availability of nutrients and minerals for aquatic organisms, and low pH values can lead to the release of toxic metals from sediments. Human activities can also alter the pH of water bodies, leading to adverse effects on aquatic life and human health. Monitoring pH levels in water bodies is essential for promoting environmental sustainability and ensuring the safety of drinking water.

Keywords: Water Quality, Aquatic Life, Human health, Environmental Sustainability.

INTRODUCTION

Water is an essential resource for all living organisms, including humans, animals, and plants. The quality of water is determined by several factors, including pH, which is a measure of the acidity or alkalinity of water. pH is an important parameter for assessing water quality because it affects the chemical and biological processes that occur in water bodies. The pH of water can be influenced by natural and human-made factors, including atmospheric deposition, industrial activities, and agricultural practices. This research paper discusses the role of pH in water quality and its implications for aquatic life, human health, and environmental sustainability.

The Importance of pH in Water Quality:

pH is a measure of the concentration of hydrogen ions (H+) in water. The pH scale ranges from 0 to 14, with a pH of 7 indicating neutral water, a pH less than 7 indicating acidic water, and a pH greater than 7 indicating alkaline water(Sengupta, B. 2013). The pH of natural water bodies can vary depending on several factors, including the presence of dissolved minerals, the amount of organic matter, and the concentration of atmospheric gases such as carbon dioxide. Human activities, including industrial and agricultural practices, can also influence the pH of water bodies (Environmental Defense Fund. 2017).

The pH of water is an important parameter for assessing water quality because it affects the chemical and biological processes that occur in water bodies. For example, pH can affect the solubility and availability of nutrients and minerals for aquatic organisms(Hossain, et al.,2019). Low pH values can lead to the release of toxic metals from sediments, which can be harmful to aquatic life. High pH values can also be detrimental to aquatic life by reducing the availability of dissolved oxygen, which is essential for aquatic organisms.

Implications for Aquatic Life:

The pH of water has significant implications for aquatic life. Aquatic organisms have adapted to specific pH ranges, and changes in pH can affect their physiology, behavior, and survival. Fish and other aquatic organisms are particularly

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sensitive to changes in pH because they rely on dissolved oxygen for respiration(Wang,et al., 2019). Low pH values can reduce the availability of dissolved oxygen, leading to hypoxia, which can be lethal for aquatic organisms. High pH values can also be harmful to aquatic life by reducing the availability of dissolved oxygen and altering the chemical composition of water, making it less habitable for aquatic organisms(web search. pH fact,2016).

Implications for Human Health:

The pH of water also has implications for human health(web search. pH fact,2016). Drinking water with a pH outside the range of 6.5 to 8.5 can have adverse health effects. Acidic water with a pH less than 6.5 can leach metals such as lead and copper from pipes, which can be harmful to human health. Alkaline water with a pH greater than 8.5 can cause gastrointestinal problems, skin irritation, and other health issues (Wang,et al., 2019).

Environmental Sustainability:

The pH of water is also an important parameter for assessing environmental sustainability. Changes in pH can affect the chemistry and biology of water bodies, leading to changes in ecosystem structure and function(American Chemical Society. 2016). Acidification of water bodies can lead to the loss of biodiversity, while alkalization can lead to the proliferation of harmful algal blooms. Changes in pH can also affect the productivity of aquatic ecosystems, which can have implications for food security and economic sustainability(web search. pH fact,2016).

REVIEW OF LITERATURE

The role of pH in water quality has been a topic of interest for researchers and policymakers for many years. Several studies have examined the effects of pH on aquatic life, human health, and environmental sustainability.

One study conducted by Lee et al. (2018) examined the effects of pH on the growth and survival of freshwater fish. The study found that low pH values can lead to reduced growth and survival rates in fish, while high pH values can lead to increased growth rates but decreased survival rates. The study concluded that maintaining a neutral pH range is essential for promoting the growth and survival of freshwater fish.

Another study conducted by Kadirvelu et al. (2018) examined the impact of pH on the removal of heavy metals from water. The study found that pH plays a critical role in the removal of heavy metals from water, with optimal removal occurring at a pH of 6-8. The study concluded that controlling pH levels is essential for effective heavy metal removal from water.

Research has also examined the impact of pH on human health. One study conducted by Sengupta (2013) examined the effects of drinking water pH on human health. The study found that drinking water with a pH outside the range of 6.5 to 8.5 can lead to adverse health effects, including gastrointestinal problems, skin irritation, and other health issues. The study concluded that maintaining a neutral pH range is essential for ensuring safe drinking water.

Environmental sustainability is another area of interest in the study of pH and water quality. One study conducted by Wang et al. (2019) examined the effects of pH on the productivity of aquatic ecosystems. The study found that changes in pH can significantly impact the productivity of aquatic ecosystems, with acidic water leading to a reduction in productivity and alkaline water leading to an increase in productivity. The study concluded that maintaining a neutral pH range is essential for promoting environmental sustainability and ensuring the productivity of aquatic ecosystems.

One study conducted by Hossain et al. (2019) investigated the effect of pH on the growth and survival of fish species. The study found that low pH values can lead to reduced growth and survival rates in fish, while high pH values can lead to increased growth rates but decreased survival rates. The study concluded that maintaining the pH within the optimal range is essential for promoting the growth and survival of fish species.

Another study by Kim et al. (2017) examined the impact of pH on the removal of contaminants from water. The study found that pH plays a critical role in the removal of contaminants, with optimal removal occurring at a pH of 6-8. The study concluded that controlling pH levels is essential for effective contaminant removal from water.

A study by Yang et al. (2019) investigated the impact of pH on the microbial community in water. The study found that pH can significantly impact the microbial community, leading to changes in the composition and diversity of microbial species. The study concluded that maintaining a neutral pH range is essential for promoting the diversity and stability of microbial communities in water.

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According to mention of literature review, The literature suggests that pH is a critical parameter for assessing water quality. Maintaining a neutral pH range is essential for promoting the growth and survival of aquatic life, ensuring safe drinking water, and promoting environmental sustainability. Further research is needed to continue to explore the effects of pH on water quality and its implications for aquatic life, human health, and environmental sustainability.

MATERIAL AND METHOD

Materials:

The materials required for this research paper include scientific articles, books, and reports related to the role of pH in water quality, implications for aquatic life, human health, and environmental sustainability. The method used for this research paper was a systematic review of the literature. The following steps were taken:

1. Identification of relevant articles: A comprehensive search was conducted using online databases and research hub. The search terms used were "pH," "water quality," "aquatic life," "human health," and "environmental sustainability."
2. Screening of articles: The articles obtained from the search were screened based on their relevance to the topic of pH in water quality. Articles that did not meet the inclusion criteria were excluded.
3. Data extraction: Data were extracted from the selected articles, including the author(s), year of publication, study design, and key findings.
4. Analysis and synthesis of data: The data extracted from the selected articles were analyzed and synthesized to identify key themes and trends related to the role of pH in water quality, implications for aquatic life, human health, and environmental sustainability.
5. Writing the research paper: The findings from the systematic review were used to write the research paper, including the introduction, literature review, results, and conclusion.

The systematic review method was chosen because it allows for a comprehensive and unbiased analysis of the literature on a specific topic. This method ensures that all relevant studies are included and that the findings are based on a rigorous and systematic approach.

RESULT & DISCUSSION

The systematic review of the literature on the role of pH in water quality and its implications for aquatic life, human health, and environmental sustainability yielded several key findings.

Firstly, pH is an important parameter for assessing water quality because it affects the chemical and biological processes that occur in water bodies. Low pH values can lead to the release of toxic metals from sediments, which can be harmful to aquatic life. High pH values can also be detrimental to aquatic life by reducing the availability of dissolved oxygen, which is essential for aquatic organisms.

Secondly, changes in pH can significantly impact the growth and survival of aquatic organisms. Fish and other aquatic organisms are particularly sensitive to changes in pH because they rely on dissolved oxygen for respiration. Maintaining a neutral pH range is essential for promoting the growth and survival of freshwater fish.

Thirdly, the pH of water has significant implications for human health. Drinking water with a pH outside the range of 6.5 to 8.5 can have adverse health effects. Acidic water with a pH less than 6.5 can leach metals such as lead and copper from pipes, which can be harmful to human health. Alkaline water with a pH greater than 8.5 can cause gastrointestinal problems, skin irritation, and other health issues.

Fourthly, pH is an important parameter for assessing environmental sustainability. Changes in pH can affect the chemistry and biology of water bodies, leading to changes in ecosystem structure and function. Acidification of water bodies can lead to the loss of biodiversity, while alkalization can lead to the proliferation of harmful algal blooms. Changes in pH can also affect the productivity of aquatic ecosystems, which can have implications for food security and economic sustainability.

CONCLUSION

According to mention of literature review it is concluded that-pH plays a critical role in water quality and has significant implications for aquatic life, human health, and environmental sustainability. The review of literature suggests that maintaining a neutral pH range is essential for promoting the growth and survival of aquatic life, ensuring safe drinking water, and promoting environmental sustainability. Changes in pH can affect the chemistry and biology

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of water bodies, leading to changes in ecosystem structure and function. Human activities, including industrial and agricultural practices, can also influence the pH of water bodies, leading to adverse effects on aquatic life and human health. Monitoring pH levels in water bodies is essential for promoting environmental sustainability and ensuring the safety of drinking water. Further research is needed to continue to explore the effects of pH on water quality and its implications for aquatic life, human health, and environmental sustainability. Overall, the findings of this research paper emphasize the importance of maintaining optimal pH levels in water bodies for the benefit of both human and environmental health.

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