

Effect of pH on the nitrate removal in algae bioreactor

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Abstract: In this study, nitrate removal in a bio with chlorella vulgaris was investigated by varying pH .change in nitrate concentration and algae growth were monitored. Maximum removal rate of nitrate and maximum algae growth was achieved when the pH of the solution was 8.

1. Introduction

Nitrate is a widespread pollutant to global water system, most commonly groundwater and surface water .The accumulation of nitrate has a negative impact on both the environment and human health (Hallberg, .1989).In most common case, domestic and agricultural wastewater contain high amount of nutrients such as nitrogen in the form of ammonia. However, in the rivers, nitrate and ammonium are the most common forms of nitrogen, nitrate alone accounts for over 80% of total nitrogen. (Fang, 2011). Therefore it is necessary to remove the nitrate from the water bodies.

Micro algae is capable of removing contaminates such as nitrate. (Renuka,2013).Algae growth is affected by different variable. Therefore those variables can directly affect the removal of nitrate.

2. Objective

The main objective of the study was to investigate the effect of pH on nitrate removal rate in the bio reactor with algae.

3. Materials and Methods

The bio reactor consisted of 1000 mg/L NaNO₃ and chlorella vulgaris. Experiment was conducted to study the effect of uncontrolled pH on the nitrate removal rate (uptake) by chlorella vulgaris. Range of initial pH of algae solution was varied from 5-9 by using CH₃COOH and NaOH. pH was measured using orion pH meter. The nitrate content in the cathodic solution was measured with the help of nitrate ion selective electrode from Hanna Instruments.

4. Results and Discussion

As shown in figure 1, Algae growth with time increases with time. Highest growth was achieved in pH 8. Lowest growth was achieved in pH 5 .After 7 days, there was a growth of 1.52g/L and 0.84g/L in pH 8 and pH 5 respectively.

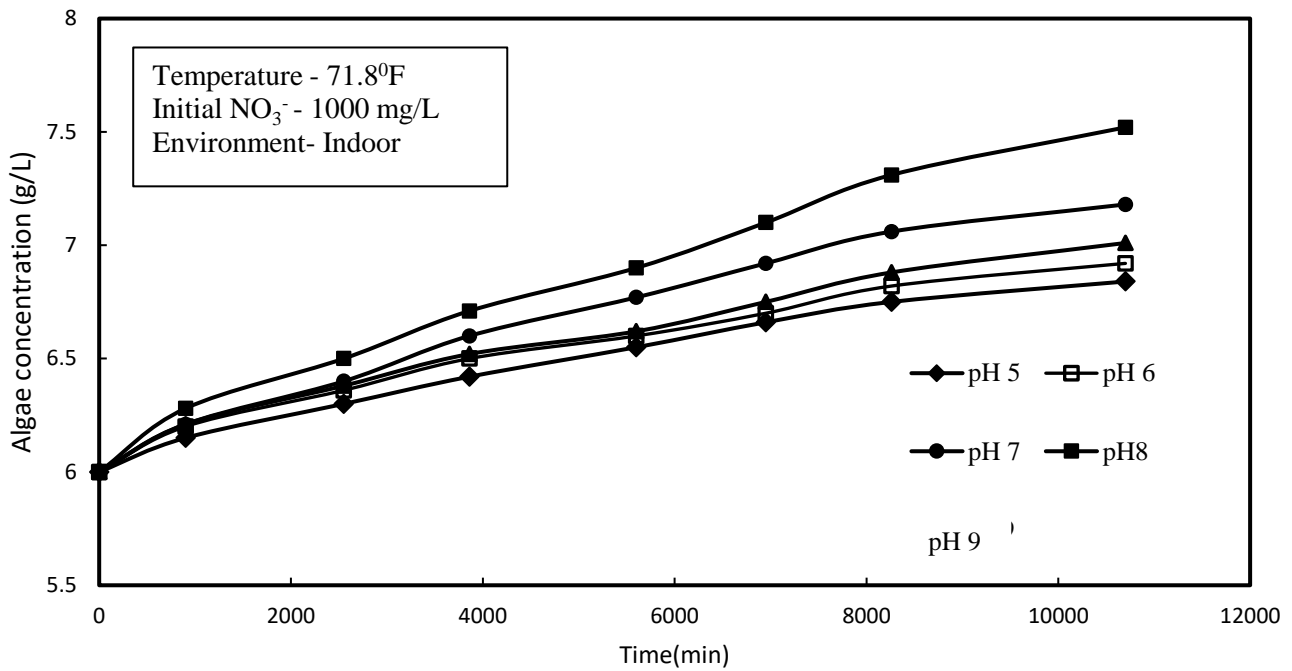


Figure 1- Variation algae growth with time for all pH conditions

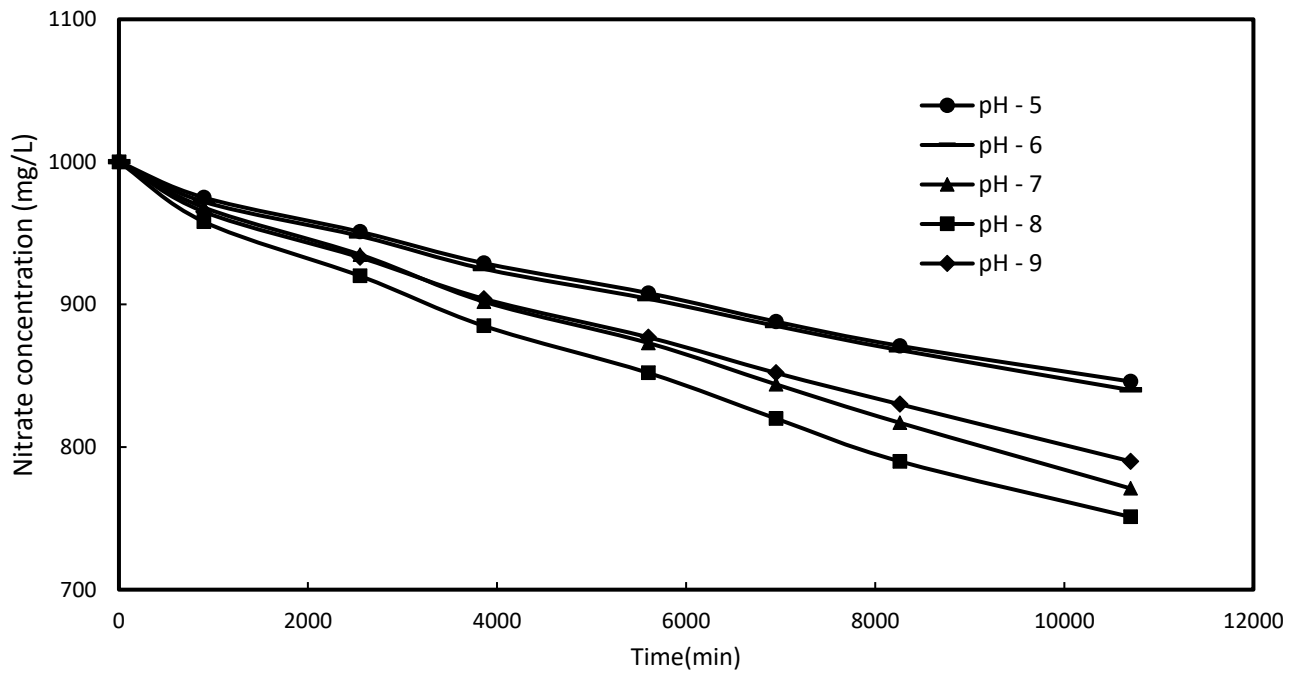


Figure 2- Variation of nitrate concentration with time

As shown in figure 2, nitrate concentration reduced with time for all pH levels. Highest nitrate removal rate was achieved when the initial pH was 8. Nitrate removal rate, as shown in Figure 3, was 42g/L in day 1 when the initial pH was 8. The lowest removal rate was 25g/L in pH 5. After day 1, nitrate removal rate started to decrease with time for all pH levels.

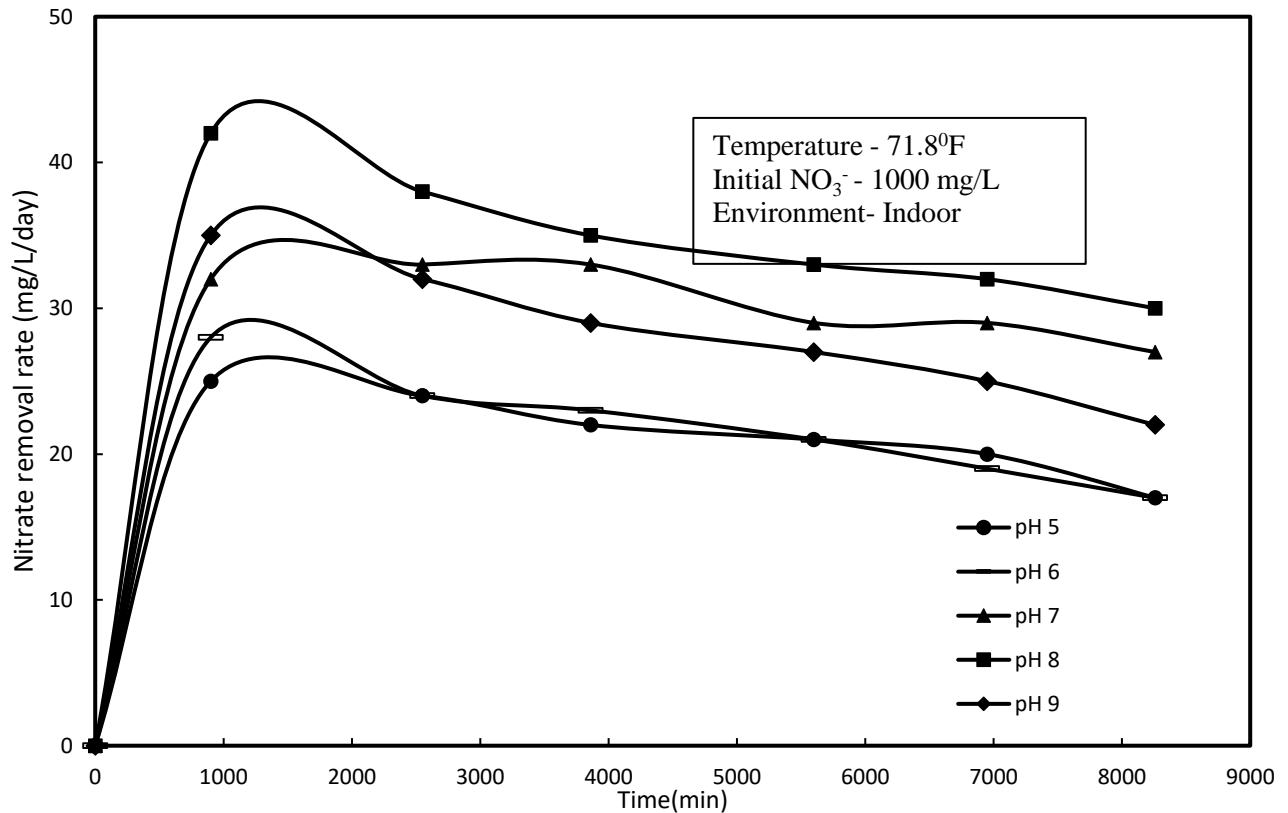


Figure 3 Variation of nitrate removal rate with time

4. Conclusions

1. Growth of algae increased by 80.9% when pH was increased from 5 to 8.
2. Highest nitrate removal rate of 42g/L was noticed in pH 8. It was 68% more than the removal rate noticed in pH 5.

5. Acknowledgment

This study was supported by the Texas Hazardous Waste Research Center (THWRC). Sponsors are not responsible for any of the conclusions.

6. References

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