

ABSTRACT

This study aimed to phosphorus recovery from the waste activated sludge (WAS) explore release performance and efficiency related to pH=8, pH=10 at 25°C and pH=8 at 30°C. Experiments were done according to alkaline fermentation. The experimental results show that phosphorus release was 48% for pH=10 at 25°C, 42% for pH=8 at 25°C. The optimum condition of phosphorus release by using alkali fermentation was pH=10 at 25°C and The optimum condition of VFA production was pH=8 at 25°C.

INTRODUCTION

Phosphorus (P) is one of the most essential and irreplaceable nutrients and component of the complex nucleic acid structure for all living organisms (e.g., animal, plant and bacteria) and a critical factor to agriculture production.

The main P resource is phosphate rock that is non-renewable and its demand will outstrip supply after the year 2035. This makes the new strategy for P recovery from an alternative and renewable resource be one of the greatest challenges in the world.

Waste activated sludge (WAS), is one of the most important municipal wastes. WAS has a high P content that depend on the wastewater treatment process. Considering that P in WAS either distributes in organisms or exists as phosphate sedimentation, P is often recovered with hydroxyapatite or struvite after P releasing with sludge hydrolysis[1].

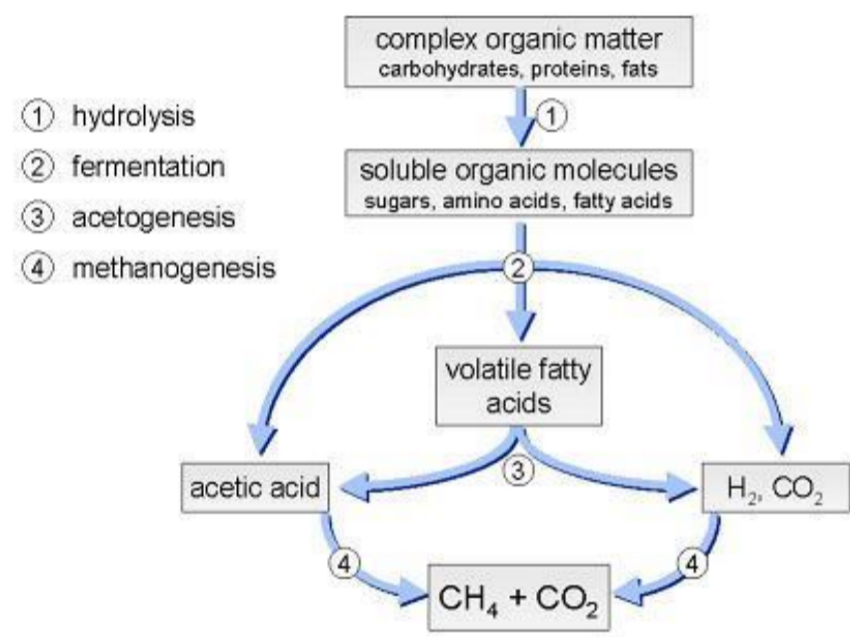


Fig.1. Anaerobic Decomposition[2]

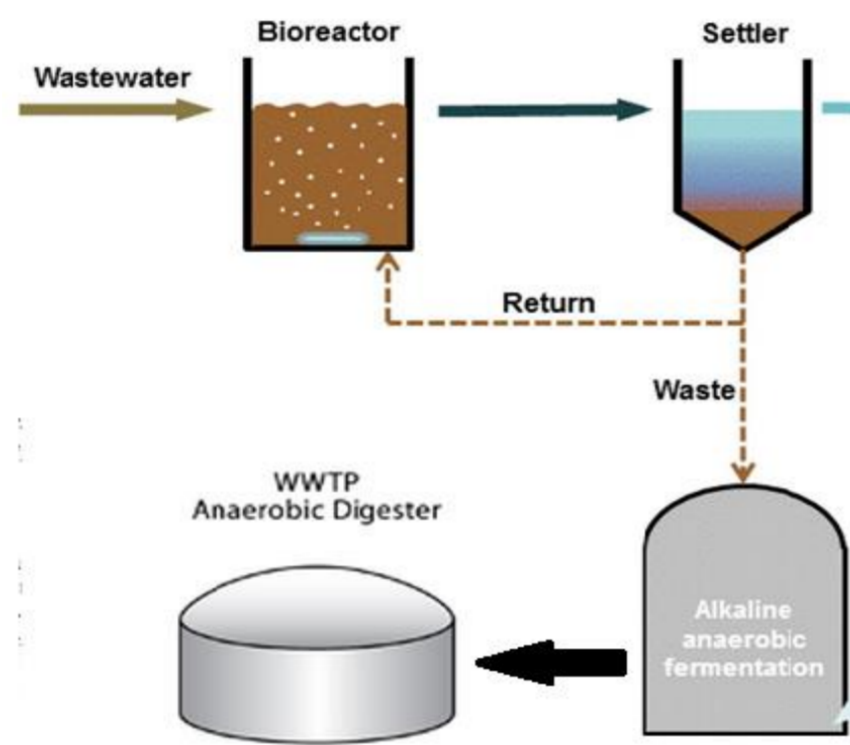


Fig.2. Waste Activated Sludge Configuration[3]

The study demonstrated the feasibility of the alkaline fermentation liquid as the carbon source of enhanced biological phosphorus removal microbes in lab-scale experiment. In this study phosphorus release from waste activated sludge was investigated through alkaline fermentation process.

Tab.1. Wastewater Characterization Phosphorus Percentage

pH=8 at 30°C	1.96 %
pH=8 at 25°C	1.66 %
pH=10 at 25°C	1.66 %

MATERIALS AND METHODS

Waste activated sludge used in experimental work was taken from Ataköy Advanced Biological Wastewater Treatment Plant. Operational conditions of fermentation reactor is given in Table 1. It was kept under anaerobic conditions. Reactor mixing provided with a magnetic stirrer.

Suspended solids (SS), volatile suspended solids (VSS), chemical oxygen demand (COD), orthophosphate (PO₄-P) and ammonia nitrogen (NH₄-N) measured according to Standard Methods. Volatile fatty acids analyses done by using gas chromatograph. Standards Measurements and Testing (SMT) protocol applied for phosphorus, First of all, taken sample is centrifuged during 15 minutes. The centrifuged sample is filtered by using syringe filter and supernatant sample is made.

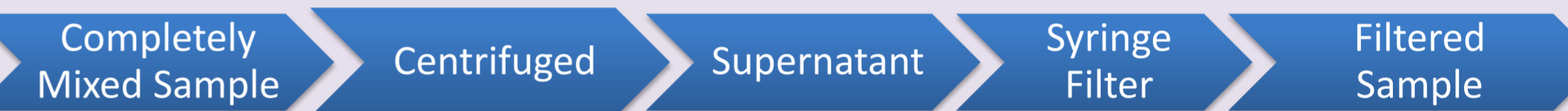
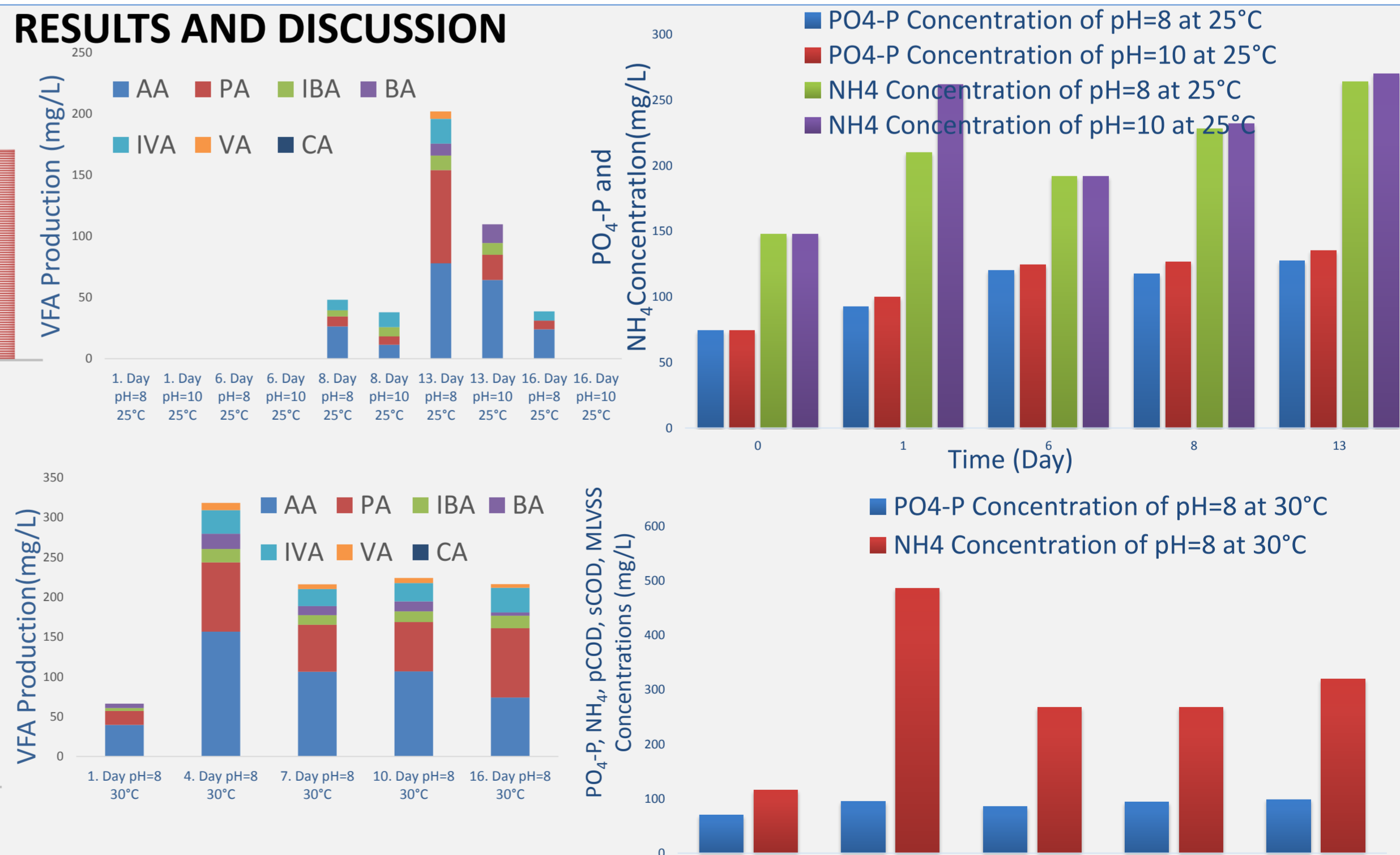
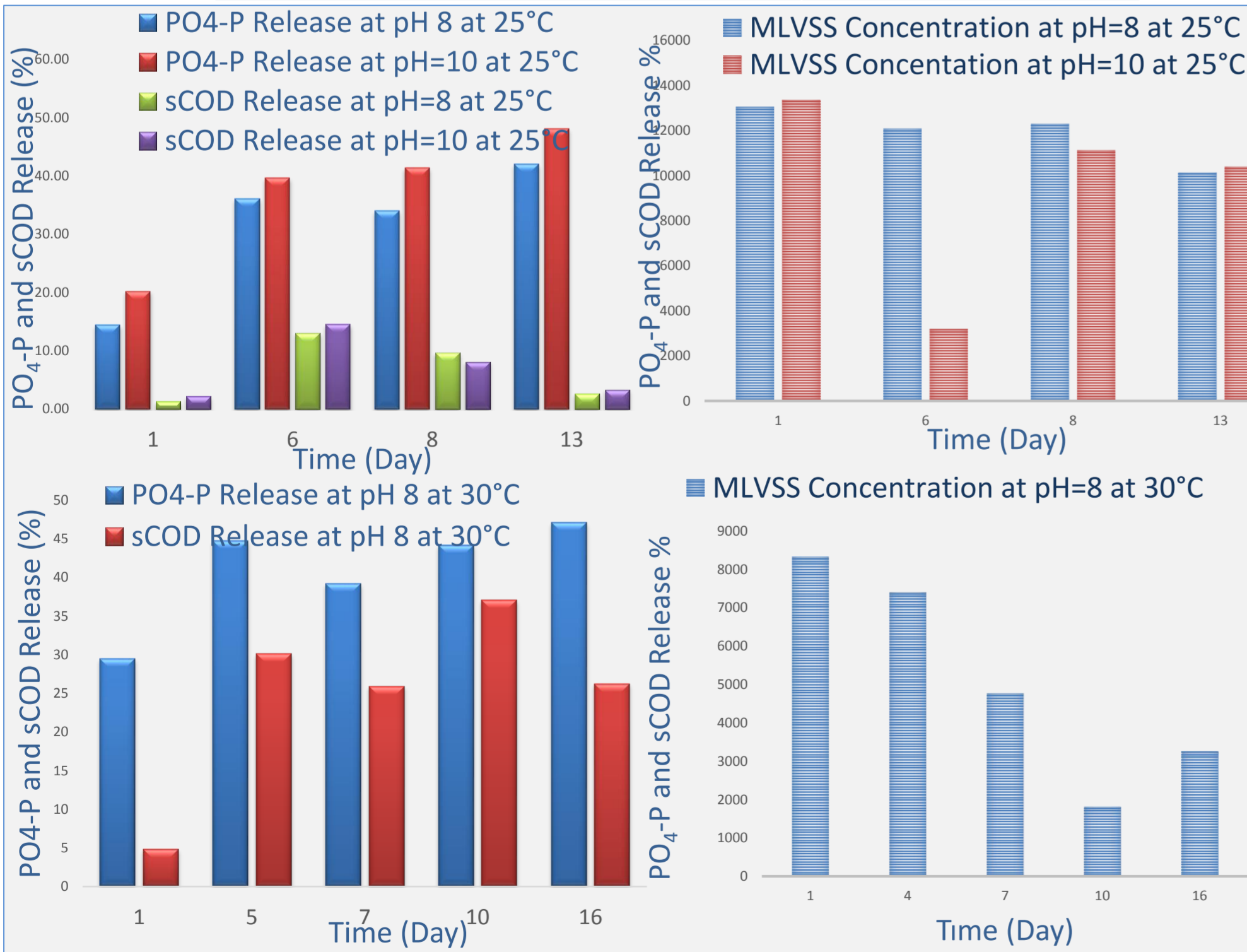


Fig.3. pH=8 and pH=10 reactors



Fig.4. Experiments of COD and Total Phosphorus

RESULTS AND DISCUSSION



CONCLUSION

As a result of the experiment,
 ✓ Phosphorus release was 48% for pH=10 at 25°C, 42% for pH=8 at 25°C at the end of the 13 days. Phosphorus release was 47% for pH=8 at 30°C at the end of the 16 days. The optimum condition of phosphorus release by using alkali fermentation was pH=10 at 25°C. Our experimental data show us pH is the main determinant and the effect of temperature was insignificant under the conditions tested in this study.
 ✓ VFA production is another benefit of alkali fermentation of waste activated sludge. According to experimental data the optimum condition of VFA production was pH=8 at 25°C. The temperature and pH were also significant factors of VFA production.

REFERENCES

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