# Eutrophication Remediation: The Effectiveness of Chemical Coagulants at Phosphate Precipitation

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The impacts of phosphate pollution on eutrophic ecosystems are debilitating, often causing excessive algae growth which leads to the formation of dead zones. To combat the harmful impacts of eutrophication, this study evaluated the effectiveness of 3 coagulants, potassium aluminum sulfate, calcium hydroxide, and ferric chloride, in precipitating phosphate from eutrophic waters while also maintaining safe levels of harmful ions in the sample that are introduced by the coagulants. Wastewater effluent and agricultural runoff, samples with consistently high concentrations of phosphate, were collected for testing. Each sample received 3 different treatments, alum/ferric chloride, alum/lime, and lime/ferric chloride, in a 1:4 mole ratio and underwent fixed periods of fast mixing, slow mixing, and settling. Precipitates were removed through filtration and the phosphate, chloride, sulfate, and hydroxide ions concentrations were measured using remaining filtrate. The alum/ferric chloride treatment was ultimately most successful at precipitating phosphate from eutrophic waters with an average percent removal of 98.8%. The lime/ferric chloride treatment followed closely behind with an average percent removal of 91.3% while the alum/lime treatment yielded a low 61.3% removal. Concentrations of chloride and sulfate remained safe across all treatments with the highest concentration being 117.3 mg/L and 66.4 mg/L, respectively. Overall, the alum/ferric chloride mixture is most efficient at facilitating phosphate precipitation and therefore should be implemented as a treatment plan for wastewater effluent and agricultural runoff before it is discharged into nearby freshwater bodies.

**Awards Won:**