Georgia Tech Research Institute
Agricultural Technology Research Program

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Research Brief
May 2024

WHAT KILLED THE PAA?
Topic 3: pH, TSS, and TDS Effects

Problem Statement

Peracetic Acid (PAA) is a strong oxidizer and serves as an antimicrobial agent in poultry processing. PAA stock comes chemically stabilized. Once PAA is diluted with water or dosed into chillers, the chemical begins to decompose into acetic acid and water. PAA decomposition rates are reported as chemical half-life and measured in minutes. The chemical half-life is the time required for a quantity of PAA to reduce to half of its starting value. PAA decays rapidly in the presence of high organic loading common in immersion chillers. Organics in the chiller are found in the form of Total Suspended Solids (TSS), Fats, Oils, Grease (FOG), and Total Dissolved Solids (TDS), such as proteins, lipids, and salts.

This research brief presents results of the impact of pH, TSS, TDS, and organic nitrogen on the chemical decomposition of PAA.

Objectives

- Determine the effect that pH adjustments of water have on the stability of PAA.
- Determine the individual effects of TSS, TDS, and organic nitrogen on the decomposition rate of PAA at a set pH of 9.0.

Key Takeaways

- pH adjustment was found to have a noticeable impact on PAA stability.
- PAA was most stable at pH 4.2.
- As pH increases, the stability of PAA decreases.
- The lowest observed half-life of PAA was observed at pH 10.0.
- TSS was found to have a small impact on PAA stability.
- TDS was discovered to destabilize PAA.
- Organic nitrogen has the largest negative impact on PAA, rapidly breaking it down.

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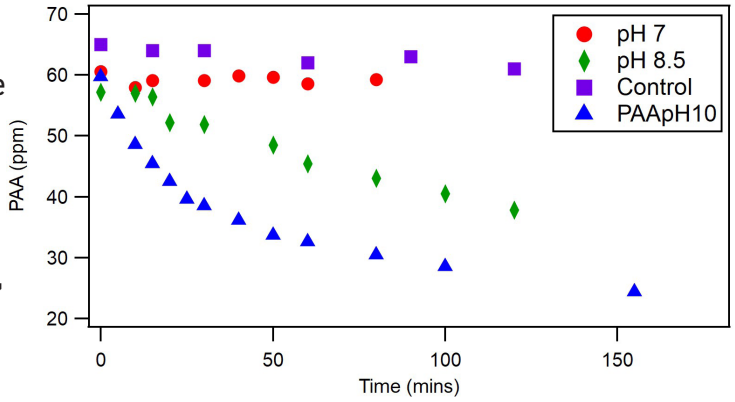
Research Methodology and Results

pH Effects on PAA Stability

Four different pHs were tested: 4.2, 7, 8.5, and 10. When PAA is added to water, the pH will adjust to 4.2 naturally. To obtain target pHs, sodium hydroxide was added so that the pH was the desired amount after PAA was added. The starting concentration of PAA was 60 ppm, and concentrations were measured at discrete time points from 1 minute to 160 minutes. Using this time and concentration data, the following half-lives were calculated:

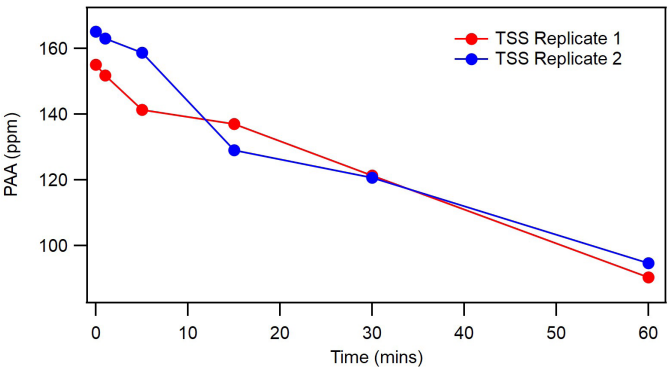
- pH 4.2: 5,400 minutes
- pH 7.0: 1,900 minutes
- pH 8.5: 200 minutes
- pH 10.0: 90 minutes



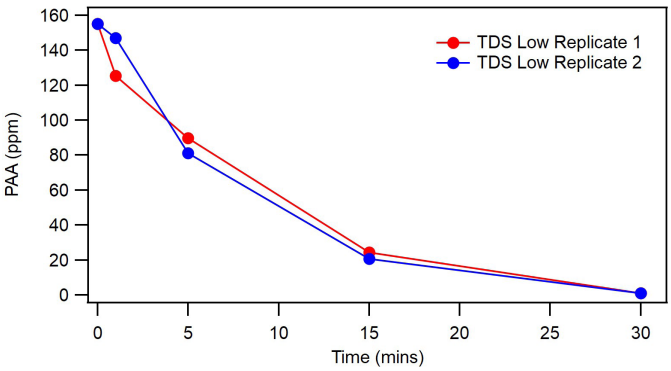
TSS, TDS, and Organic Nitrogen Effects on PAA Stability

Total Suspended Solids (TSS), Total Dissolved Solids (TDS), and organic nitrogen solutions were tested for PAA decay. TSS was prepared by adding chicken feather meal to water. TDS was prepared by chilling four WOGs in 4 gallons of water with air agitation. Organic nitrogen was prepared by adding target compounds to water. Each solution was characterized before testing. pH was adjusted to 9.0. The starting concentration of PAA was 160 ppm, and concentrations were measured at discrete time points until PAA was no longer detectable. Using this time and concentration data, the following half-lives were calculated:

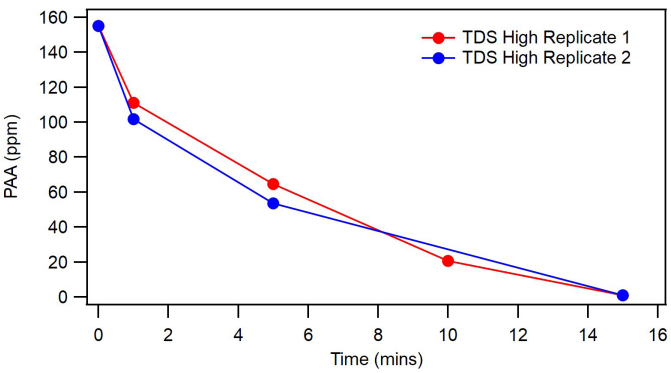
TSS (2,000 ppm): **80 minutes**



TDS low (1,750 ppm): **6 minutes**



TDS high (3,500 ppm): **3 minutes**



Organic nitrogen (250 ppm): **1-10 minutes**