Georgia Tech Research Institute
Agricultural Technology Research Program

atrp.gatech.edu

Research Brief
November 2024

WHAT KILLED THE PAA?
Topic 4: Effects of TDS Components

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 effect of TDS components (cations, blood, proteins) on the chemical decomposition of PAA.

Objectives

- Determine the effect that individual TDS components have on the stability of PAA.
- Compare individual TDS component's effect on PAA half-life to that of combined TDS components.

Key Takeaways

- Individual TDS components by themselves did not have a substantial effect on PAA stability.
- Three different protein types and lipids (oil) all showed similar effects on PAA stability.
- Cations (magnesium, calcium, sodium, and potassium) and poultry blood had the largest effect on PAA stability.
- Cations and blood, individually, decreased PAA's half-life by 25%.
- Once two individual TDS components are combined, a noticeable negative effect on PAA stability was observed.
- When cations and proteins were combined, there was a decrease of 70% in PAA's half-life.
- When cations and blood were combined, the effect was a 75% drop in PAA stability.

Continued on back

Technical Contacts: Daniel Sabo, Ph.D., Senior Research Scientist | daniel.sabo@gtri.gatech.edu | 404.407.6730
Stephanie Richter, Research Scientist II | stephanie.richter@gtri.gatech.edu | 404.407.6075

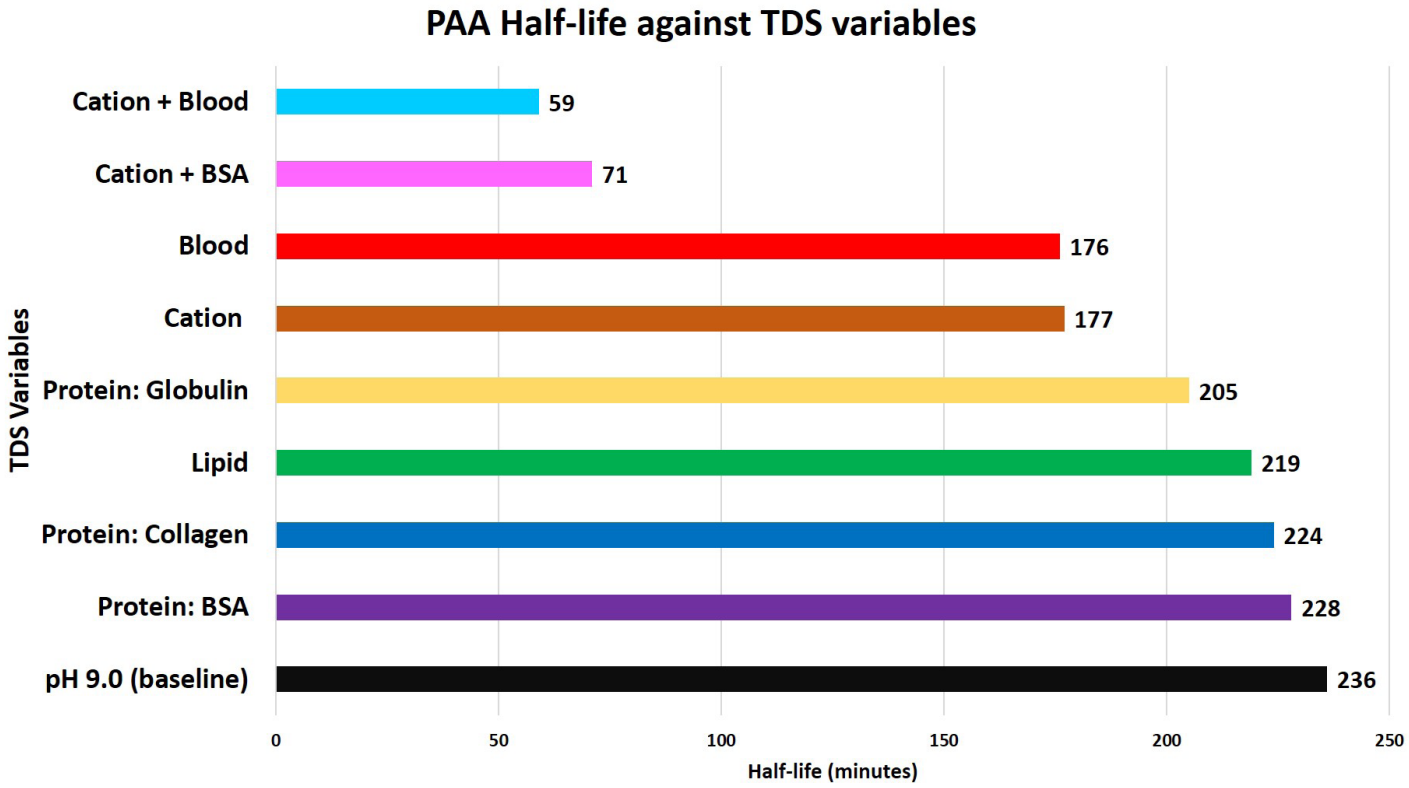
Research Methodology and Results

TDS Solutions Tested for PAA Decay

- Bovine serum albumin (BSA) @ 2,000 ppm
- Globulin @ 2,000 ppm
- Collagen @ 2,000 ppm
- Lipid (oil) @ 800 ppm
- Poultry blood @ 200 ppm
- Cations

Cations Recipe
+ sodium @ 60 ppm
+ calcium @ 35 ppm
+ magnesium @ 20 ppm
+ potassium @ 160 ppm

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 half-life was calculated. A baseline was determined for PAA's decay in pH 9.0 deionized water only. The half-lives are reported and compared as seen in the graph below.



The results show that individually, each component has little effect on PAA stability, ranging from 3% (BSA protein) up to 25% (blood). Once two of the components are combined, there is a large negative effect on PAA's half-life. For cations plus BSA, 70% of PAA's half-life is lost compared to the baseline. Cations combined with blood decreased PAA stability by 75% compared to the baseline.