

Peracetic Acid Stability



Inspexx™ 250

GENERAL INFORMATION

PRODUCT TYPE	22% Peroxyacetic acid
USE	Food additive antimicrobial

BACKGROUND

Peroxyacetic acid (PAA) is a widely used antimicrobial, although little has been published regarding variations in PAA formulation and impact on chemical stability. PAA is formulated by reacting acetic acid and hydrogen peroxide (H_2O_2) in the presence of an acid catalyst and with the inclusion of a metal chelating stabilizer, however this reaction is not complete and the reactants (acetic acid and hydrogen peroxide) are present in the final composition. In some cases, manufacturers chose to add mineral acids, such as sulfuric acid, to accelerate equilibrium of the reaction, rather than add larger quantities of an acid stabilizer, such as 1-hydroxyethylidene-1,1-diphosphonic acid (HEDP). The stability of PAA in the solution of a given PAA formulation can vary greatly based upon the ratio of these components relative to PAA.

STABILITY STUDY SUMMARY

An accelerated stability study at 100° F (40° C) was conducted in vented containers to compare the impact of formulation attributes of peroxide and stabilizer content, as well as the use of sulfuric acid as a reaction catalyst, on stability of PAA in solutions with approximately 22% PAA. Formulations tested in the study simulated Ecolab products and other commercially available 21-24% PAA solutions sold as food additive antimicrobials based on published US Food and Drug Association (FDA) Food Contact Notifications (FCNs). All formulations presented are stabilized solely with HEDP, as the most common and only export approved stabilizer for peracetic acid solutions applied to food tissue.

STUDY CONDITIONS	100° F storage in vented containers for 6 weeks
FORMULATION VARIABLES	PAA to peroxide ratio, stabilizer content
STABILITY METRIC	PAA content measured weekly by iodometric titration

RESULTS SUMMARY

Peracetic acid in formulation was most stable in compositions with high levels of peroxide in relationship to peracetic acid. For instance, an approximately 22% PAA formulation with 19% hydrogen peroxide retains more of the PAA activity over time than a 22% PAA solution containing either 14% or 9% hydrogen peroxide, as illustrated in figure 1.

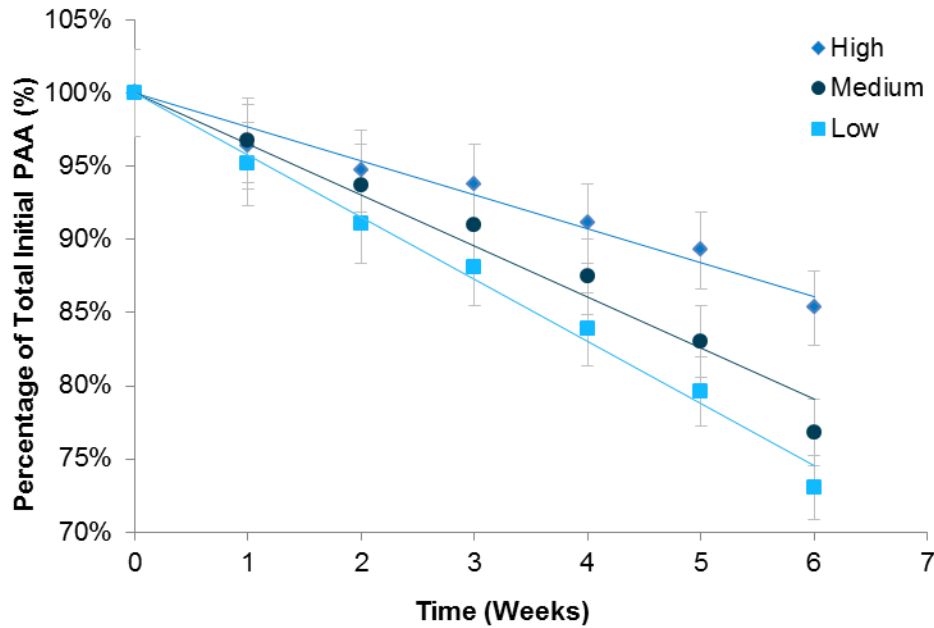
PAA stability of 22% PAA solutions was directly correlated to the quantity of HEDP stabilizer in solution. Solutions with less than 0.9% HEDP were less stable and took an additional week to reach equilibrium, as illustrated in figure 2.

Sulfuric acid, when added to an HEDP stabilized 22% PAA solution had a negative impact on PAA stability, as illustrated in figure 3.

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H ₂ O ₂ :PAA Ratio	Initial Percent PAA (%)	Initial Percent H ₂ O ₂ (%)
High	23.1%	18.7%
Medium	23.1%	13.6%
Low	21.4%	8.7%

Figure 1. Stability of PAA in compositions with varying levels of hydrogen peroxide

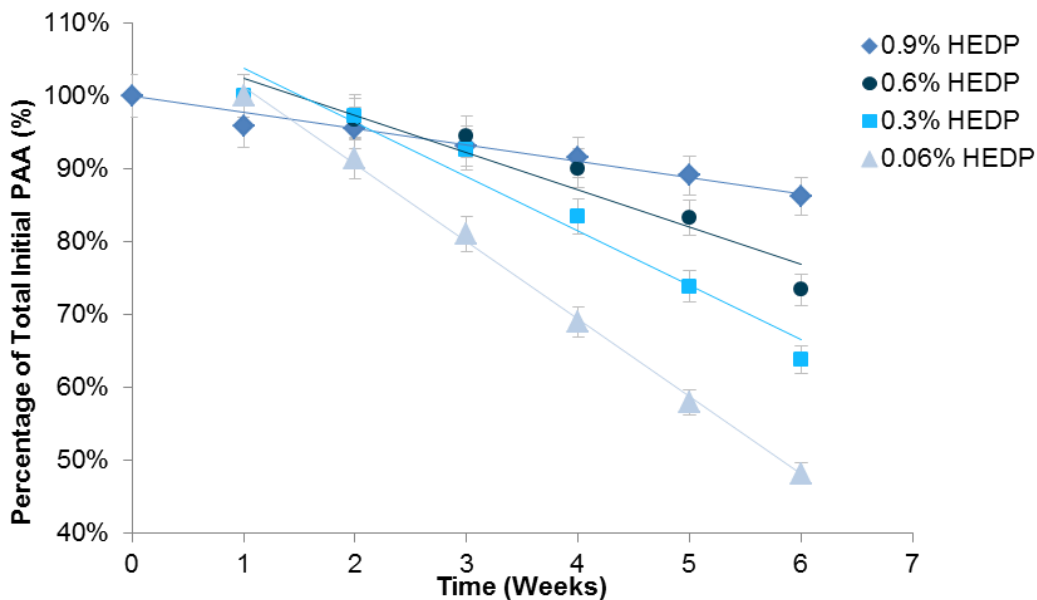


Figure 2. Stability of PAA in composition with varying levels of HEDP stabilizer

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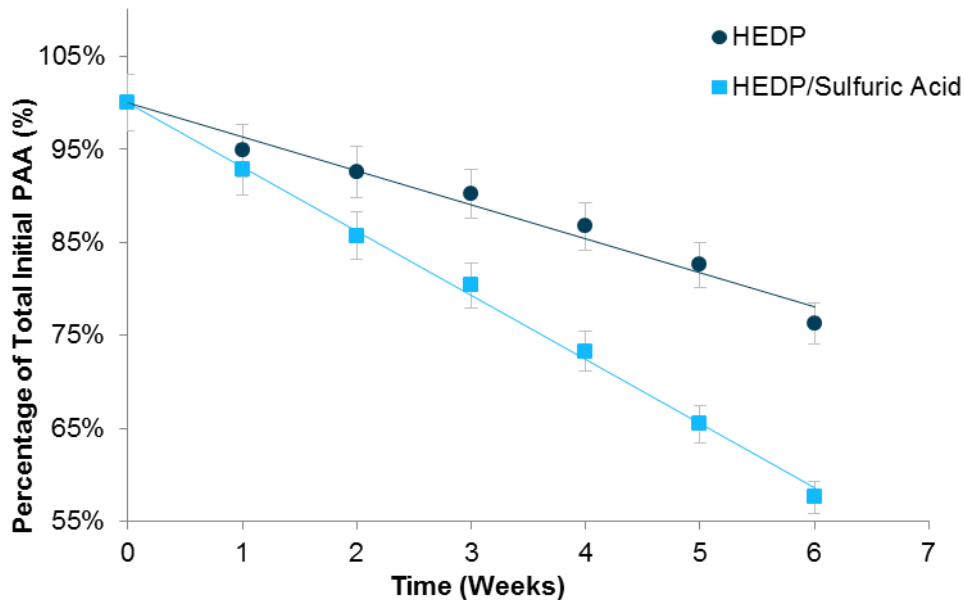


Figure 3. Impact of sulfuric acid addition on HEDP stabilized 22% PAA formulations

CONCLUSION

The stability of 22% PAA solutions is significantly influenced by the formulation of the product. Higher levels of hydrogen peroxide, as relative to PAA content, and HEDP stabilizer led to the most stable PAA solutions. PAA solutions which also included sulfuric acid as a catalyst to the reaction were less stable than those formulated without sulfuric acid.

ABOUT INSPEXX 250

Ecolab's Inspexx 250 was formulated with the highest safety and stability in mind, as demonstrated by the unique formulation containing 22% PAA, 16% hydrogen peroxide 0.9% HEDP, and yielding higher PAA stability than other commercial products with lower levels of peroxide, HEDP, or containing sulfuric acid. High levels of product stability help to minimize adjustments at the plant level, assuring the highest levels of food safety and quality. Inspexx 250 is approved by the US FDA FCN 1745 and listed USDA/FSIS Directive 7120.1 as safe and suitable for treatment of poultry and meat, at up to 2000 ppm PAA.