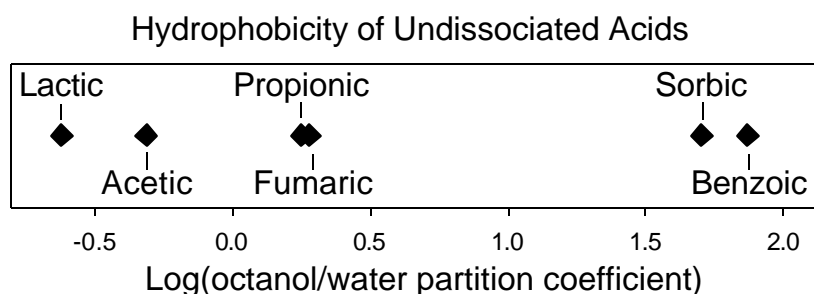


Organic Acids as Antimicrobial Agents

Hydrophobicity

The effectiveness of an organic acid as an antimicrobial agent depends on two factors – its hydrophobicity and how much completely undissociated acid is present. In most cases, antimicrobial effectiveness improves with hydrophobicity, as shown in the diagram below. Sorbic and Benzoic Acids are more potent antimicrobial agents than the other acids shown. Fumaric Acid has been shown to be a more effective antimicrobial agent than Lactic or Acetic Acids in many applications. Tartaric, Citric, and Malic Acids are all less hydrophobic than the acids shown and are less effective as antimicrobial agents. Hydrophobicity is important because the microbial cell wall normally contains lipid material. Hydrophobic organic acids can interact with this lipid material in a way that disrupts microbial activity.



Level of Completely Undissociated Acid

The second factor, the level of completely undissociated acid, can be predicted from the pKa1. All of the acids shown here are more effective antimicrobial agents at lower pHs because the level of completely undissociated acid increases as pH falls. Dissociated acids are less effective because they are less hydrophobic.

Fumaric Acid as an Antimicrobial Agent

Fumaric Acid in combination with Sodium Benzoate was shown to have a bactericidal effect against *E.Coli* O157:H7 in apple cider. Fumaric Acid would help juice processors achieve the mandated 5-log pathogen reduction. See “Fumaric Acid in Fruit Juice Drinks”, in the Beverages section.

Fumaric Acid was shown to be more effective than Lactic or Acetic Acids in reducing populations of *E.Coli* O157:H7, *Listeria monocytogenes*, and *Salmonella typhimurium* in surface treatment of beef muscle. See “Fumaric Acid in Antimicrobial Surface Treatments of Meat”, in this section.

Fumaric Acid was shown to be more effective than Lactic or Acetic Acids in reducing populations of *E.Coli* O157:H7, *Listeria monocytogenes*, and other pathogens in the treatment of salad vegetables. See “Fumaric Acid in Antimicrobial Sprays or Dips for Fresh Fruits and Vegetables”, in this section.

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