

Title Antimicrobial activity of malic acid against *Listeria monocytogenes*, *Salmonella Enteritidis* and *Escherichia coli* O157:H7 in apple, pear and melon juices

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Abstract

Minimal inhibitory (MIC) and minimal bactericidal (MBC) concentrations of malic acid against *Listeria monocytogenes*, *Salmonella Enteritidis* and *Escherichia coli* O157:H7 inoculated in apple, pear and melon juices stored at 5, 20 and 35 °C were evaluated. MICs and MBCs against *L. monocytogenes*, *S. Enteritidis* and *E. coli* O157:H7 were significantly affected by storage temperature, juice characteristics and type of microorganism. Malic acid was more effective at 35 and 20 °C than at 5 °C in all studied fruit juices. *E. coli* O157:H7 was more resistant to malic acid than *S. Enteritidis* and *L. monocytogenes*. Apple, pear and melon juices without malic acid were inhibitory to *E. coli* O157:H7, *S. Enteritidis* and *L. monocytogenes* at 5 °C, whereas, MBCs of 1.5% (v/v) of malic acid in apple and pear juices, and 2% (v/v) in melon juice at 5 °C were needed to reduce *E. coli* O157:H7, those concentrations being higher than those required to reduce *S. Enteritidis* and *L. monocytogenes* in those fruit juices. In addition, concentrations of 2%, 2.5% and 2.5% (v/v) of malic acid added to apple, pear and melon juices, respectively, were required to inactivate the three pathogens by more than 5 log cycles after 24 h of storage at 5 °C. Transmission electron microscopy showed that malic acid produced damage in the cell cytoplasm of pathogens without apparent changes in the cell membrane.