



Synergistic effects of elevated hydrostatic pressure, mild heat, malic acid, and citricidalTM against wild-type, rifampicin-resistant, and pressure-stressed Shiga toxin-producing *Escherichia coli*

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ABSTRACT

The application of high-pressure processing is gaining importance and momentum in the food industry. In this hurdle validation study, strain mixtures of *Escherichia coli* O157:H7 (STEC) and non-O157 serogroups (nSTEC) were used in three phenotypes of wild-type, rifampicin-resistant, and pressure-stressed. After a 48-hour habituation, elevated hydrostatic pressure of 300–600 MPa was tested. While 300 MPa treatments at 4.4°C resulted in 0.45 log reduction ($P < 0.05$) of STEC after 5 min, the same treatment resulted in 4.26 and 6.02 log reductions ($P < 0.05$) with the addition of malic acid and citricidalTM, respectively. Results of our study illustrate that application of selected antimicrobials could, to a great extent, augment the decontamination efficacy of pressure-based treatments. Additionally, we observed that the STEC and nSTEC serogroups of the pathogen have comparable sensitivity to elevated hydrostatic pressure and the antimicrobials. Thus, a validated treatment plan against STEC serogroups is most probably equally effective against nSTEC serogroups as well.

ARTICLE HISTORY

Received 8 May 2025

Accepted 4 July 2025



KEYWORDS

High-pressure processing; elevated hydrostatic pressure; Shiga toxin-producing *Escherichia coli*; malic acid; citricidalTM

1. Introduction

Escherichia coli is a Gram-negative bacterium commonly found in the intestines of humans and animals, where it typically exists harmlessly. While many strains are benign, *E. coli* has the potential to act as an opportunistic pathogen, leading to various illnesses such as diarrhea and infections beyond the intestines, including urinary tract infections [1]. The *E. coli* strains capable of causing foodborne diseases are classified into different pathotypes based on their virulence and mechanisms of pathogenicity. Notable pathotypes include enteroaggregative *E. coli*, enteropathogenic *E. coli*, and Shiga toxin-producing *E. coli* [2,3].

Among the various pathotypes, Shiga toxin-producing *E. coli* produces a potent cytotoxin called Shiga toxin. A subgroup of Shiga toxin-producing *E. coli*, known as

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