

Title Use of mustard flour to inactivate *Escherichia coli* O157:H7 in ground beef under nitrogen flushed packaging

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Abstract

This study was undertaken to determine whether the glucosinolates naturally present in non-deheated mustard flour could serve as a source of allyl and other isothiocyanates in sufficient quantity to kill *Escherichia coli* O157:H7 inoculated in ground beef at three different levels, during refrigerated storage of the meat under nitrogen. Mustard flour was mixed at 5%, 10% or 20% (w/w) with freshly ground beef, then the beef was inoculated with a cocktail of five strains of *E. coli* O157:H7 at either 3, 6 or $\leq 1.6 \log_{10}$ cfu/g. The ground beef was formed into 100 g patties and each was placed in a bag of Nylon/EVOH/PE, which was back-flushed with 100% N₂, heat-sealed and stored at 4 °C for ≤ 21 days. During storage, the allyl isothiocyanate (AIT) levels in package headspaces were determined by gas liquid chromatography. By 21 days, the levels present in treatments were not significantly different. After 21 days storage, there were 0.5, 3 and 5.4 \log_{10} decreases in numbers of *E. coli* O157:H7 from the initial levels of 6 \log_{10} cfu/g in meat containing 5%, 10% and 20% mustard flour, respectively. When inoculated at 3 \log_{10} cfu/g, *E. coli* O157:H7 was reduced to undetectable levels after 18, 12 and 3 days with 5%, 10% and 20% mustard flour, respectively. When immunomagnetic separation (IMS) was used for *E. coli* recovery following its inoculation at $\leq 1.6 \log_{10}$ cfu/g, 5% mustard did not completely eliminate the pathogen from ground beef stored for 6 days. The natural microflora of the ground beef which developed in vacuum packages was unaffected by the addition of 5% mustard flour but some inhibition was found at higher concentrations. Sensory evaluation of the cooked ground beef showed that there were no significant differences in the acceptability of meat treated with 5 or 10% mustard flour. However, panelists could distinguish untreated controls from mustard treatments, but considered the mustard-treated meat to be acceptable. These results showed that it is possible to use mustard flour at levels of >5–10% to eliminate *E. coli* O157:H7 from fresh ground beef.