Title Evaluation of minimally processed salads commercialized in Portugal

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Abstract

During the last decades food borne outbreaks associated with consumption of raw vegetables have been increasing and green leafy vegetables seem to be the most frequently implicated products.

In order to determine the microbial quality and the incidence of the major food borne pathogens in Minimally Processed (MP) salads commercialized in Portugal, a survey was conducted in Lisbon Retail Markets, from July 2007 to August 2008, to determine microbial contamination loads and identify potential pathogenic bacteria.

A total of 151 samples were purchased from 2 supermarkets: 38 romaine lettuce, 12 various spinach and 101 mixed salads with three or four different ingredients. The samples were tested for aerobic psychotropic micro-organisms (APM), Enterobacteriaceae, *Escherichia coli*, *Listeria* spp., presumptive *Bacillus cereus*, *Aeromonas hydrophila* and *Clostridium perfringens* counts as well as for presence of *Salmonella* spp., *Listeria monocytogenes* and *E. coli* O157. Samples were also evaluated for taste quality.

The results showed that APM counts of romaine lettuce and mixed salads had a similar median, respectively, 6.2 and 6.5 log cfu/g and mixed spinach had the highest one (7.6 log cfu/g). The median value found for Enterobacteriaceae was 5.44 log cfu/g. Only four samples showed positive result for *E. coli* (2.65%) but just one (0.8%) had a slightly higher load of contamination. Although the percentage and levels of contamination loads were low, these mustn't be ignored, for the reason that the strains in three of the samples belong to VTEC group (1.99%). *E. coli* O157, *Salmonella* spp. and *C. perfringens* weren't detected in any sample. For the enumeration of *Listeria* spp., two samples (1.32%) had presence of *Listeria innocua* and *L. monocytogenes* had an incidence of 0.66%. *A. hydrophila* was identified in 11 samples (7.28%), and in 8 of them with considerable counts ($>10^5$). Contamination with *B. cereus* was found in 22.7% of samples analyzed, though in small numbers, which doesn't represent a major concern to food safety. All isolated strains were assessed for its potential toxin production and it was found that 40% of these strains had this ability. Results from sensory panel showed organoleptic differences in salads during its shelf-life period.