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Effect of combination of essential oils and bacteriocins on the efficacy of gamma radiation against *Salmonella* Typhimurium and *Listeriam onocytogenes*

Aude Ndoti-Nembe[1], Khanh Dang Vu[1], Nicolas Doucet[2] & Monique Lacroix[1]

[1]*Research Laboratories in Sciences Applied to Food, Canadian Irradiation Center (CIC), INRS-Institut Armand-Frappier, University of Quebec, and* [2]*INRS-Institut Armand-Frappier, University of Quebec, Laval, Quebec, Canada*

Abstract

Purpose: **Using essential oils (EO) alone or combined EO with nisin to enhance the lethality of *Salmonella* Typhimurium and *Listeria monocytogenes* to γ-irradiation treatment.**

***Materials and methods*: Cell suspension or inoculated carrots (10^6 colony forming unit (CFU)/ml) of *L. monocytogenes* or *Salmonella* Typhimurium were treated with carvacrol and mountain savory EO alone or treated by the combined EO plus nisin and were irradiated at different doses. The radiation dose required to reduce bacterial population by 90% (D_{10} value) and the relative sensitivity (RS) of treated bacteria to irradiation were calculated.**

foodborne illnesses, but the most important foodborne illnesses are caused by foodborne pathogenic bacteria. According to the Public Health Agency of Canada, each year 11–13 million of Canadians suffer from foodborne illnesses. In the US, the government estimates that the number of illnesses caused by consumption of contaminated food is about 76 million cases per year (Tauxe 2001). Of these 76 million cases, there are 325,000 hospitalizations and 5,000 deaths (Mead et al. 1999). *Listeria monocytogenes* and *Salmonella* Typhimurium are among the most concerning food pathogens causing serious food diseases. *Salmonella* Typhimurium can cause hemolytic uremic syndrome or rec-