

Antibacterial activity of nutmeg (*Myristica fragrans* Houtt.) extract against foodborne pathogens on raw beef during chilled and frozen storage

ABSTRACT

In recent years, demands for minimal processing and free-synthetic preservatives are increasing because of growing concern among consumers regarding the safety issues of additives. Nutmeg (*Myristica fragrans* Houtt.) has been used as a spice and traditional medicine in Asian countries. This study aimed to determine the antibacterial activity of nutmeg extract against foodborne pathogens on raw beef during storage. Nutmeg seeds were extracted using a maceration method with methanol as a solvent. The extract was assessed for antibacterial activity against a range of microorganisms using the disc diffusion assay, minimum inhibitory concentration and minimum bactericidal concentration. The effect of heat and different pH of the extract on its antibacterial activity was also conducted to evaluate the stability of the extract. The effects of the extract at different concentrations on the microbial population of the raw beef during chilled ($4.0\pm 0.2^{\circ}\text{C}$) and frozen ($-18.0\pm 0.2^{\circ}\text{C}$) storage for 21 days were then evaluated. The nutmeg extract exhibited antimicrobial activity against the range of microorganisms tested, which was stable at high temperature ($80.0\pm 2.0^{\circ}\text{C}$) and in the pH range tested (3.0, 6.8, and 11). Furthermore, the extract significantly inhibited microbial growth on raw beef stored for 21 days in chilled or frozen conditions, indicating that the nutmeg extract has the potential to be developed as a natural antimicrobial preservative in beef.

Keyword: Antibacterial activity; Nutmeg extract; Natural preservative