

ELEVATING CONTROL OF PATHOGENIC BACTERIA IN FERMENTED AND NON-FERMENTED SAUSAGE USING LACTIC ACID BACTERIA OR ESSENTIAL OILS

ABSTRACT

In this study, inocula of identified strains of *Staph. aureus*, *Listeria monocytogenes*, *E. coli* O157:H7 and *Salmonella sp* were added individually to manufactured sausage to evaluate the effect of different treatments on behavior of pathogens in fermented and non-fermented sausage. Fermented sausage was inoculated with activated starter containing *Lactococcus lactis* and *Lactobacillus plantarum* while, non-fermented sausage was treated by adding the minimum inhibitory concentration (MIC) of either cumin or marjoram essential oils. Survival of pathogens and microbiological, chemical and organoleptic evaluations were carried out at different intervals during 60 days. Coliform bacteria completely disappeared after 7 days for all starter treatments while it disappeared for all cumin or marjoram treatments after 15 days. Starter treatments had a slight higher proteolytic bacterial count than control while essential oils treatments were lower than control treatments. Both starter and essential oils treatments containing various pathogens recorded the rapid decrement in nitrite content and the lowest increment level of total volatile nitrogen (TVN) as compared to negative or positive control. On the other hand, using lactic acid bacteria or essential oils of cumin and marjoram showed the highest reduction level and the lowest counts of *Staph. aureus*, *L. monocytogenes*, *E. coli* O157:H7 and *Salmonella sp* than positive control. In addition, decreasing of the pathogens counts began on the 3rd day of storage, while positive control of all pathogens showed a slight decrease in number of pathogens and then increased by increasing the storage period. Moreover, starter treatments were more constant treatments and showed maximum organoleptic scores as compared to negative and positive controls while cumin followed by marjoram treatments recorded the lowest decrement rate in overall scores than that of negative and positive controls.

Key words: Pathogenic bacteria, lactic acid bacteria, essential oil, cumin, marjoram, survival of pathogens, organoleptic evaluation

INTRODUCTION

Foodborne pathogens such as diarrheagenic serotypes of *Escherichia coli*, *Staph. aureus*, *Salmonella* and *Listeria monocytogenes* are widely distributed in nature, causing considerable mortality and morbidity in the population (Indu *et al.*, 2006). Therefore, there has been increasing concern of the consumers about foods free or with lower level of chemical preservatives because these could be toxic for humans. Also, they have demanded for foods with long shelf-life and absence of risk of causing foodborne diseases. This perspective has put pressure on the food industry for progressive removal of chemical preservatives and adoption of natural alternatives to obtain its goals concerning microbial safety (Souza *et al.*, 2005).

As a result, there has been great interest and research on naturally produced antimicrobials, such as bacteriocin-producing lactic acid bacteria (LAB). These natural antimicrobials present high potential to be applied in hurdle technology, which utilizes synergy of combined treatments to more effectively preserve foods (Cleveland *et al.*, 2001). Furthermore, the antimicrobial compounds produced by LAB play an important role in ensuring the safety and extending shelf-life of sausage (Rafael and Martinis, 2005). In addition, many spices, herbs, their extracts and their essential oils are known for their antioxidant and antimicrobial activity against certain foodborne pathogens. Spices are recognized to stabilize the foods from the microbial deterioration. Also,

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