Thesis Title Application of antioxidant and antimicrobial properties of Chiang Rai assam green tea infusion in food model system

Author Miss Risky Ayu Kristanti

Degree Master of Science (Food Technology)

Supervisory Committee Lecturer Dr. Niramol Punbusayakul Chairperson

ABSTRACT

Recently, green tea has received much attention and popularity in worldwide consumption as a result of its health benefits. Those health benefits are considered to be its high antioxidant and antimicrobial properties. Chiang Rai is the biggest tea cultivation area in Thailand. However, tea antioxidant and antimicrobial properties are influenced by various factors, including the cultivating area, cultivating practise and processing. Therefore this study aimed to investigate the antioxidant and antimicrobial properties of Chiang Rai's commercial assam green tea infusion *in vitro* and the ability of those commercial assam green tea infusions to extend shelf life of some food models.

The investigation of antioxidant properties of commercial assam green tea infusion in Chiang Rai, represented by *A, B, C, D,* and *E,* were evaluated *in vitro* in terms of total polyphenol content (TPC) and diphenyl-picrylhydrazyl (DPPH) scavenging activity. Whereas, antimicrobial activity was evaluated against 4 selected pathogens, *Staphylococcus aureus*, *Salmonella typhimurium*, *Escherichia coli* and *Listeria monocytogenes*, tested by an agar diffusion method. Some chemical composition profiles in green tea products were evaluated by HPLC. It was found that *A* provided the highest TPC (23.50 % w/w dry basis (db)), followed by *B* (20.18 % w/w db), *C* (17.40 % w/w db), *D* (15.95 % w/w db) and *E* (15.86 % w/w db), respectively. These results were consistent to their DPPH scavenging activity and their pathogen inhibitory ability. All green tea infusions were notably able to inhibit gram-positive bacteria than

gram-negative bacteria. The main compounds found in all assam green tea infusions were caffeine (CF), epigallocatechin (EGC), epicathechin (EC), gallic acid (G) and catechin (C). Assam green tea infusion with the highest antioxidant and antimicrobial activities contained both EC and EGC as major catechins. These suggest that these EC and EGC contributed to their antioxidant and antimicrobial activities.

Assam green tea infusions were also applied to liquid medium containing the selected microorganisms to evaluate their ability to inhibit microorganisms to mimic liquid food models. Minimum Inhibitory Concentration (MIC), which is the tea concentration exhibiting completely inhibitory effects, was used to determine the assam green tea infusion microbial inhibitory effect in this experiment. Among all assam green tea infusions, *A* and *B* were observed to have the most inhibitory effect to all pathogens in the liquid medium, indicated by the the lowest MICs for *S. aureus* (50 mg/ml)*, L. monocytogenes* (75 mg/ml), *S. typhimurium* (150 mg/ml) and *E. coli* (225 mg/ml), compared to *C, D* and *E.* These results were also observed when the assam green tea infusion was applied to watermelon juice incubating with the selected microorganisms at 35 °C for 7 days. The results showed that the pH of watermelon juice was significantly reduced when the assam green tea infusion was added ($p \leq 0.05$). *A* and *B* inactivated *S. aureus, L. monocytogenes, S. typhimurium* and *E. coli* within 2, 3, 5 and 6 days, respectively.

Assam green tea infusion was also applied to cooked meat model systems in order to evaluate its anti-lipid oxidation and antimicrobial activities. *A* and *B* at the concentration of 250 mg/ml effectively reduced all pathogens in the cooked beef to an undetectable level within 2 days of storage at 4 °C. It was also found that *A* and *B* exhibited higher anti-lipid oxidation activity compared to the commercial antioxidant, 0.02 % BHA/BHT and the control, respectively. The addition of those assam green tea infusions in cooked beef significantly increased ΔL^* value and decreased Δa^* and Δb^* value ($p \leq 0.05$). These indicate that Chiang Rai assam green tea infusion provided significant improvements in terms of the microbial safety and quality of watermelon juice and cooked beef, and it might be a good preservative for preserving other types of food with the same purposes.

Keywords : Antimicrobial, Antioxidant, Assam green tea, Cooked beef, Shelf life, Watermelon juic