Pornpen Morakotjinda 2012: Risk Management of *Escherichia coli* in Sweet Basil and Coriander for Export. Doctor of Philosophy (Food Science), Major Field: Food Science, Department of Food Science and Technology. Thesis Advisor: Assistant Professor Warapa Mahakarnchanakul, Ph.D. 146 pages.

The objective of this research was to determine the sources of microbial contamination on exported sweet basil and coriander. Samples of investigation were farm environmental and utensils in packing house, practices during processing such as washing process were observed as well. The results showed that *E. coli* was detected in all environmental sources (seed, soil, fertilizer, and irrigation water) in sweet basil farm. While only soil in coriander farm was found *E. coli* contamination at 1.2-3.0 log CFU/g. The population of *E. coli* contamination in sweet basil farm environment were high in seed, soil and irrigation water with 4.8-4.9, 0.7-3.3, and 0.9-2.0 log CFU/g,ml, respectively. Surprisingly, low level of *E. coli* contamination was found in fertilizer (0.7 log CFU/g). According to the results from environmental swab samples from packing house (gloves, table, scissors and cover material), all observed utensils were in unhygienic condition and found *E. coli* contamination ranging from 0.2 to 4.9 log CFU/g,cm^2. The prevalence and population of *E. coli* contaminated in wash water taken from both farms were high (90-100%, 1.1-3.2 log CFU/ml). Microbiological results indicated that wash water could be the main source of cross contamination in packing house since the population of *E. coli* contaminated in vegetables after washing was higher than before washing. A total of 249 vegetable samples were collected throughout the fresh produce process from farm to factory in years 2009 to 2011, the trends of *E. coli* contamination in sweet basil and coriander increased throughout the process which ranged from 0-4.0 log CFU/g (year 2009) and 0-3.6 log CFU/g (year 2011). In 2009, 67% and 100% of exported sweet basil and coriander were contaminated with *E. coli*. However, the *E. coli* contamination in exported vegetables in year 2011 was less than year 2009. Further experiment was conducted to explore the possibility of cross contamination affected by 1) shaking force, 2) reused water, and 3) simultaneously washing with and without 50 ppm sodium hypochlorite. Results showed washing with 50 ppm sodium hypochlorite reduced *E. aerogenes* contaminated in vegetables by 1.1-1.4 log CFU/g, from the initial load 4.2 log CFU/g). No significant difference ($P \geq 0.05$) when increasing washing time (from 5 to 15 min) and applying shaking force. While, washing with reused water, 9-46% of *E. aerogenes* in reused water was transferred to sound vegetables. The cross contamination between contaminated vegetables to wash water was inhibited when washing in chlorinated water. Cross contamination between contaminated and sound vegetable was inhibited when simultaneously washing in chlorinated water. Exposure assessment studies were conducted to describe which step of fresh produce process from harvesting to factory affected the population of *E. coli* contaminated in vegetables at receiving factory. Simple approach model and regression model were conducted. Sensitivity analysis was carried out by using tornado rank correlation and regression analysis feature in @Risk^{TM} software. The population of *E. coli* contaminated in vegetables after harvesting step was the most factor influence the *E. coli* contamination at receiving factory. Then, risk estimation of illnesses caused by consuming the exported fresh produce contaminated with *Salmonella* spp. or *E. coli* were developed. The risk of illnesses per 100,000 populations when consume the sweet basil or coriander contaminated with *Salmonella* spp. were found to be 37.9 or 31.2 consumers from ingestion contaminated produce at 4.9 or 6.7 log MPN/serving, respectively. In case of enteropathogenic *E. coli* contaminated in sweet basil or coriander, 1.4×10^{-5} or 0 consumers become ill from ingestion of 0.03 or 0 log CFU/serving. The investigation of contaminated source in fresh produce process will assist to reduce the risk of *E. coli* contamination and develop the control strategies to enhance the food safety of Thai exported fresh produce.

_____ _____ ___ / ___ / ___

Student's signature Thesis Advisor's signature