

## Chapter 1

### Introduction

#### 1.1 Principles, Rationale and Hypothesis

Pineapple (*Ananas comosus*) is one of three spearhead fruits which have been encouraged to grow in Vietnam recently. It is a non-climacteric tropical fruit that shows moderate to low rates of respiration and ethylene production (Wills *et al.*, 2007). In Vietnam, the yield of pineapples for each year is very high, which was 800,000 tons in 2009 (VFVA, 2008). There are many different groups of pineapples but Queen pineapple is the most attractive and caused a lot of attention because of its texture, taste and flavor. The most popular used from pineapple products is fresh pineapple. Exporting pineapple fruit is seen as one of the main productions of the fruit industry in Vietnam in the future (VFVA, 2008). The pineapple such as Queen has a non-smooth skin on the surface, therefore shell splits become one of suitable places for development of microorganism. Moreover, Vietnam is a country with a tropical weather, high temperature, and high relative humidity. The relative humidity in many areas in Vietnam during the pineapple season can be high as 84% and up to 88%. Additionally, the temperature achieved highs of 27-28°C in those times. A lot of sunshine, a lot of rainfall, high temperature and high relative humidity throughout the year have created many disadvantages on pineapple fruit after harvest and during storage. Fungi, yeast, and bacterium development will easily decrease the fruit quality. Thus, in the cropping seasons, pineapple fruit easily gets spoilage from microorganisms. About 20% of pineapple fruits in Vietnam do not reached to the consumer demand because of rottenness, low maintaining, or maintaining in non-suitable ways (GSO, 2008).

In order to extend the postharvest life of pineapple fruits, some researches have been done on storage conditions such as temperature storage, chemical treatments and packaging conditions. Low temperature is an important method to maintain its freshness, and at the same time it can extend the postharvest life of

pineapple. However, chilling injury is a popular symptom on pineapples at low temperature. The application of refrigeration on tropical and subtropical fruits is limited by the chilling injury symptoms at temperatures below 13°C (Brown, 1986). The symptom is also discovered on the Queen type Mauritius variety and the Cayenne type Kew variety of pineapple (Wilson-Wijeratnam *et al.*, 2005). Besides low temperature methods, packaging materials and conditions are popular trends in fruit preservation recently. Most of the researches on packaging materials, such as polypropylene film, stretch film, chitosan/methylcellulose film at low temperature or modified atmosphere conditions, have been focused on fresh-cut pineapple, especially for Smooth Cayenne and Red Spanish pineapples (Montero-Calderon *et al.*, 2008; Sangsuwan *et al.*, 2008b). The incorporation of vanillin into biodegradable film as an antimicrobial agent to inhibit the growth of microorganism on fresh-cut pineapple was studied (Sangsuwan *et al.*, 2008b). The incorporation of antimicrobial agents into film can create a different environment inside the package that may delay or prevent the growth of microorganisms on the product's surface. When antimicrobial agents are incorporated into film, they diffuse out of the film, thus improving its antimicrobial efficacy (Brody *et al.*, 2001; Zivanovic *et al.*, 2005). Carbendazim is a benzimidazole fungicide that plays a very important role in the control of fungi and diseases on plants and fruits. The application of carbendazim as an antimicrobial agent on chitosan/methylcellulose film is a new trend in fruits and food packaging.

The research on the antimicrobial films application on pineapple particularly on Queen pineapple is still very limited. Therefore, the objectives of this study were to evaluate the quality of pineapple, especially Queen pineapple, by the combination of carbendazim or vanillin into chitosan/methylcellulose to maintain fresh quality, reduce weight loss of the pineapple fruit and increase microbial inhibition properties during pineapple preservation.

### **1.2 Research Objectives**

- To assess morphological characteristics, physical and chemical properties of Vietnamese pineapple fruit cv. Ninhbinh.
- To develop antimicrobial chitosan/methylcellulose based film and study properties of the film.

- To apply the antimicrobial film with pineapple fruit and study its effects on product quality.

### **1.3 Research Scope**

In this study, the film was made based on chitosan/methylcellulose combined with carbendazim as an antimicrobial agent and applied the film to preserve pineapple fruit.

### **1.4 Education/Application Advantages**

The antimicrobial film may be used as an alternative to synthetic plastics. The film may extend the shelf-life of pineapple fruits and reduce the growth of microorganisms and may have application with other types of fruits, especially for smoothless-skin fruits and vegetables products.

### **1.5 Research Location**

- Postharvest Technology Research Institute, Chiang Mai University, Thailand
- Faculty of Agro-Industry, Chiang Mai University, Thailand
- Faculty of Food Science, Danang University, Vietnam
- Faculty of Food Industry, College of Food Industry, Vietnam