

Chapter 1

Introduction

1.1 Principles and Rationale

Genus citrus fruit includes several important fruits such as orange, lime, lemons and grape fruits. Lime fruit is one of the important horticultural crops, with worldwide agricultural production over 100 million metric tons per year. The rapid growth of the citrus fruit industry is happened in the last 25 years. The large consumption of citrus fruit is also attributed to other types of food and beverage industry (Kale and Adsule, 1995). Almost half of the citrus fruits produced are processed into juices, concentrates, jams and by-products, such as citric acid and pectin, etc (Council of Scientific and Industrial Research of India, 1996).

Lime fruit (*Citrus aurantifolia* Swingle), locally known as Ma-nao, is one of economic fruits in Thailand. Although, the fruit grows well all year-round under Thailand climatic condition, it has a short shelf-life period causing a great demand during time of scarcity. It is, therefore, considered desirable to process lime to bottled juice (Chaisawadi *et al.*, 2003). Like other citrus fruit, its processing to juice has faced a problem of delayed bitterness due to the presence of bitter compound and astringent taste during subsequent storage of the juice. Bitterness reduces the quality and value of citrus juices and thus has a significant negative impact on the citrus industry (Maier *et al.*, 1980). Juices with higher bitterness concentrations than the human bitterness threshold of 6 ppm are considered of poor quality and low market value (Guadagni *et al.*, 1974).

Generally, fruit juice processing requires heat to destroy microorganisms. Although the use of heat is an effective mean in the controlling of microbes quantity, such heat will result in the alteration of nutritional values and characteristics of food. High pressure food processing is thus a new interesting alternative to the conventional thermal food processing (Butz *et al.*, 2004). High pressure treatment is already used as a new method for preserving foods without the need to apply high temperatures and can preserve small molecules in food such as nutrient, color, odor and taste. At the same time, some microorganisms in the food can be killed (Nienaber and Shellhammer, 2001).

The objective of this study was to reduce the bitterness of lime juice (*Citrus aurantifolia* Swingle) during storage at 4-6°C and at ambient temperature by addition of hydrocolloids. A combination of Ultra-High Pressure processing and hydrocolloids was also investigated for its effect on the bitterness, the overall qualities and shelf-life of the fresh lime juice. The study assessed the chemical, physical, microbiological, nutritional and sensory characteristics of the lime juice during the storage period.

1.2 Study objectives

1. To study the overall qualities and characteristics of fresh lime juices during storage at 4-6°C and at ambient temperature.
2. To investigate the effect of different types and levels of hydrocolloids on the overall qualities of lime juice during storage at ambient temperature.
3. To understand the effect of Ultra-High Pressure processing on the overall qualities of hydrocolloids-treated lime juices during storage at 4-6°C and ambient temperature.

1.3 Usefulness of the research (theoretical and/or applied)

1. Improve the qualities of lime juice by increasing its shelf-life and reducing the bitterness problem.
2. Increasing the economical value and market share of lime fruit/juice.
3. Reducing the problem of lime fruit farmer during a high production of lime fruit by providing an interesting alternative process.
4. Providing an alternative solution for other food/citrus products that have a similar problem like the lime juice.

1.4 Research plan

This study was designed to understand the effects of hydrocolloids either alone or combined with Ultra-High Pressure processing on the bitterness quality of lime juice. The overall qualities and shelf-life of the hydrocolloid-added lime juice were assessed during storage at 4-6°C and at ambient temperature for 1 month. Analyses that were conducted during the study include the chemical, physical, microbiological and nutritional characteristics of the lime juices together with some sensory evaluation during storage of the juices.