CHAPTER 1 INTRODUCTION

1.1 Background

Papaya (*Carica papaya L.)* is one of the most popular and economically important fruit in Thailand. It is cultivated all over the country, easily grown and available throughout the year. The total cultivate area in Thailand is about 112,381 rai and total production is 211,594 tons (Department of Agricaltural Extension Information Center, 2010). The most popular ancestral papaya is Khaek Dam papaya and mainly cultivated in the northeast and central of Thailand. At present Khaek Dam papaya are growing around Thailand and it has become the most popular papaya because it has exotic and sweet taste while it is abundant, cheaper than others (Thai Market, 2011 and Department of International Trade, 2011).

Papaya is high in ascorbic acid content (vitamin C), Vitamin A, Vitamin E, folate and potassium. Papaya can be consumed in both raw and ripe forms. Raw papaya is used for making papaya salad (Som-tum) and other such as soup and pickle. Ripe papaya is used for fresh or in mixed salad and food industry. Papaya puree is intermediate papaya product and is thermally processed for the manufacture of jam, jelly, sweets and so on. Papaya is expensive and popular in developed countries because of the exotic flavor. However, it is difficult to export fresh fruits, because of its delicacy and sensitivity to handling and also because of the lack of technology required for the growing, harvesting, transporting, packing, ripening etc. of fresh fruits. When fruit is transformed into puree, its external appearance is no longer important (El - Mansy et al., 2005). At present, papaya puree is produced commercially. Therefore, it is necessary to know the properties of papaya puree such as rheological and dielectric properties.

During evaporation of single strength papaya puree, some of vitamins in papaya puree can be destroyed by heat so microwave heating is an alternative thermal process. This method can reduce heating time, energy saving while improve product quality, compared to conventional heating methods. In microwave heating dielectric properties are important because the degree of heating of food materials strongly influenced by their dielectric properties. This is because dielectric properties play a major role in determining the interaction between the food material being processed and the electromagnetic energy (Nelson, 2001). The dielectric properties that are important in estimating power absorption during microwave processing is dielectric constant (ε') and the amount of power that penetrated to heat is dielectric loss factor (ε''). Microwave frequency, temperature, and chemical constituents such as moisture, salt, and ash contents have significant effects on ε', ε'' of food materials (Nelson, 2001).

Moreover, another important property is rheological property. It is necessary to understand this property for handling equipments and processing conditions for heating process in pipe involving pumping and mixing. The determined rheological parameters are a powerful tool in understanding changes in food structure during processing (Guerrero & Alzamora, 1998; Holdsworth, 1993; Mizrahi, 1979). The viscosity at different concentrations and temperatures is required for mixed flow system, the heat transfer rates; energy consumption with increases in concentration and for controlling the temperature and flow rates of heating media to ensure continuous flow of product (Nindo, Tang, Powers, & Bolland, 2004). The flow behavior also influences the pump performance (Telis-Romero, Telis, & Yamashita, 1999).

Therefore, this study focused on dielectric properties, i.e., dielectric constant and dielectric loss factor as a function of soluble solids content, temperature and frequency. Moreover, flow properties or rheological properties of papaya puree were studied at different soluble solids contents and temperatures.

1.2 Objective

1. To investigate dielectric constant and dielectric loss factor of papaya puree at various soluble solids contents, temperatures and frequencies.
2. To investigate rheological properties of papaya puree at various soluble solids contents and temperatures.

1.3 Scopes

- Dielectric properties of papaya puree were measured by varying the following,

1. The soluble solids contents of papaya puree were 10, 15, 20 and 25 °Brix.
2. The temperatures were performed at 40, 50, 60, 70 and 80 °C.
3. The frequencies ranges were performed between 315 and 8010 MHz.

- Rheological properties of papaya puree were measured by varying the following,

1. The soluble solids contents of papaya puree were 10, 15, 20 and 25 °Brix.
2. The temperatures were performed at 5, 20, 35, 50, 65 and 80 °C.

1.4 Expected Benefit

The data obtained from this study is expected to be useful for microwave heating and process design of papaya puree production.