

# CHAPTER I

## INTRODUCTION

### 1.1 Background

Jelly candy is a term referring to confectioneries made with hydrocolloid base that provides a chewy characteristic. Traditionally, this term refers to only candies made with gelatin as its hydrocolloid. But as research progress heavily, this term is not strictly followed. It is soft, chewy, and usually very sweet with a hint of sourness. Typically, all jelly candy contain high water content has gel like properties. The main ingredient to make jelly candy would be hydrocolloid. Other than hydrocolloid, sweetener also plays a very big role in this product. The most widely used hydrocolloid would be gelatin, pectin, and gums. While the most widely used sweetener are sucrose and glucose syrup. The addition of other additives like citric acid, flavoring, or coloring are optional depending on the products (Hartel *et al.*, 2018).

Sucrose by means of solid crystalline sugar is also used in jelly candy making. This sweetener is widely used due to its availability, flexibility, and price. However, supersaturated sucrose solutions as used in jelly candy production is highly prone to crystallization. This contributes to the textural properties of food products and in jelly candy, it is not acceptable. Therefore, the addition of fructose, glucose, and corn syrup is used as they can inhibit crystallization of supersaturated sucrose solution (Laos *et al.*, 2007). The most widely used would be glucose syrup, which

can be defined as purified and concentrated aqueous solution of nutritive saccharides that is derived from starch. In jelly candy production, glucose syrup is important as it imparts both flavor and prevention to crystallization. Without the addition of glucose syrup, the texture of the jelly candy will be degraded (Hull, 2010).

Reduction or substitution of sugar or syrups in confectionary products increased due to negative press of commercial syrups and consumer awareness of different disease that is caused by too much sugar. However, reduction strategies had limited success due to the importance of sugar not only as sweetener but also towards the texture. Studies that incorporate high sugar containing fruits or other sugar substitutes into confection products have been done to decrease sugar intake of consumers (O'Sullivan, 2020). Kurt *et al.* (2021) study the potential of fruit molasses to be used as sugar substitution in gummy candies made from different gelatin ratio. Grape, mulberry, and carob molasses, which contain natural sugar were bought from the local markets. Results shown that the usage of grape molasses with 78°Brix, in gummy candy production produced the preferred textural characteristic and improved structure which attributed to higher total sugar content (73.83%) and low sucrose fraction (1.19%). Study by Mutlu *et al.* (2018) show another substitution of sugar using honey in a minimally processed gelatin-based gummy candy. Results shown that by minimally processing the jelly candy at 55°C, with 15-25% gelatin, and substituting the sugar with honey produce jelly candy without the inactivation of their bioactive compound, by that producing healthier product. It is claimed to be healthier because it doesn't contain synthetic flavoring, coloring agent, and the diastase activity of honey is protected. Both studies also

stated that reduction of sugar or substitution of sugar affect the textural properties, structure, sugar content, pH, sensory acceptability, and color of the jelly candy.

Similar to dates, jujube is a type of fruits widely cultivated all around China, southwest Europe, India, and Middle East, and utilized in various forms. Either fresh, processed, or dried, jujube exhibit numerous health-promoting effects alongside many benefits. Its polysaccharide, flavonoid, and triterpenic acid are the active ingredients within jujube that account for its antioxidant effect, which contribute to immune-modulating and hematopoietic functions (Zhao *et al.*, 2008; Xu *et al.*, 2004). Chen *et al.* (2017) summarizes the dietary benefits of consuming jujube as supplements for human brain protection. Jujube is shown to possessed neuroprotection against oxidative stress, increase levels of acetylcholine, and gives sedative effect. Jujube is also known to contain high amount of carbohydrates in the form of polysaccharide (80-85%) and high moisture content around 70-80%. Alongside its benefits, jujube became a popular natural sweetener in various Chinese desserts and dishes (Liu *et al.*, 2016). Men *et al.* (2019) stated that jujube contains sucrose, D-glucose and D-fructose which could be transformed into low calorie D-allulose using D-allulose 3-epimerase alongside fermentation coupling technology. Recent study by Liu *et al.* (2020) said that glucose, galactose, arabinose, rhamnose, mannose, and galacturonic acid were the main components of jujube polysaccharide.

Other than sweetener, hydrocolloid is another key ingredient in the making of jelly candy. Several common hydrocolloids are gelatin, pectin, gum arabic, and agar-agar. Pectin is a linear polysaccharide that found naturally in plant cell wall component. It contains as many as 17 different monosaccharides with almost 20

different linkages. Main function of pectin is as gelling agent. In the presence of enough sugar and acid or calcium ions, pectin able to form gels even in aqueous solution. Two types of pectin (HMP and LMP) may be used depending on the final product and usage. High methoxyl pectin (HMP) need high sugar content but low pH values to gel. While low methoxyl pectin (LMP) requires only calcium ions to form gel. Pectin is found to be more flexible for usage especially in the food and pharmaceuticals industry. This happens due to its fast-setting time, made from natural plant materials, and ease of usage (Tyagi *et al.*, 2015). According to Hartel *et al.* (2018), pectin has been found to provide more desirable texture than gelatin. It is also made from plant materials which makes it halal and vegan. Considering its availability, ease of use, and better texture, pectin became one of the most popular hydrocolloids utilized in jelly candy making.

The downside of pectin as the hydrocolloid in jelly candy is mostly due to its texture became too soft and has lower panelists acceptance compared regular jelly candy (Yuwidasari *et al.*, 2019; Basuki *et al.*, 2014; Soedirga and Marchellin, 2022). Addition of other hydrocolloid such as carrageenan or gelatin is shown to increase the textural properties of pectin jelly candy. Carrageenan is a natural polysaccharide derived from seaweed. It is a hydrocolloid that soluble in hot water and able to create a reversible gel even under acidic pH. The optimum recommended concentration of carrageenan in jelly candy is around 0.05-3%. The flexibility and availability of carrageenan is what made this hydrocolloid quite popular to be used (Basuki *et al.*, 2014; Giyarto *et al.*, 2019).

Just like dates, jujube is also a possible substitute due to high sugar content and many nutritional benefits. It may only replace the glucose syrup because it has



same physical characteristic, and sucrose can't be substituted as the jelly candy needed structure. Carrageenan and pectin as the hydrocolloid also produce better results and safe to be consumed for halal and vegan consumers. Research utilizing carrageenan and pectin as hydrocolloid has been done before. However, in combination both hydrocolloid has not been applied to jelly candy with jujube syrup as the based. While research utilizing jujube are mostly in the form of clinical trial not applied to food product research. Therefore, this study aims to determine the preferred substitution ratio of glucose syrup with jujube syrup alongside the preferred ratio of carrageenan and pectin as hydrocolloid, towards the physicochemical and sensory characteristics of jelly candy

## **1.2 Research Problem**

Jelly candy commercially utilize glucose syrup to produce desirable texture, prevent crystallization of sucrose and utilize gelatin as the gelling agent. Evaluated qualities of jelly candy includes its physicochemical properties and sensory properties. Utilization of glucose syrup indeed produce an acceptable result. However, substitution of glucose syrup with other fruit-based syrup that also contain sugar may increase its textural and sensorial properties. The utilization of other gelling agent such as pectin and carrageenan may also be used to answer the needs of halal and vegan consumer. Thus, this research will determine the preferred substitution ratio of glucose syrup with jujube syrup alongside the preferred ratio of pectin and carrageenan as hydrocolloid.

### **1.3 Objectives**

#### **1.3.1 General Objectives**

The general objective of this research is to utilize jujube syrup as a natural sweetener to substitute glucose syrup in jelly candy formulation with different carrageenan to pectin ratio.

#### **1.3.2 Specific Objectives**

The specific objectives of this research are:

1. To obtain jujube syrup and determine its physicochemical properties.
2. To determine the preferred substitution ratio of jujube syrup to glucose syrup and preferred carrageenan and pectin ratio to be added towards the physicochemical and sensory characteristics of jelly candy.

