

# CHAPTER I

## INTRODUCTION

### 1.1 Background

Waffle cone is a baked product made from a batter mixture mainly composed of wheat flour and oil. They are baked in a mold, rolled into a cone shape, and used to serve ice cream. They are well-liked due to their distinct crunch and crispness that contrast the smooth texture of ice cream. They are often calorie dense due to their fat and carbohydrate content.

Indonesia, especially East Java, is a major producer of apples (Gazali *et al.*, 2017). Apple processing into clear, cold-pressed fruit juice produces high waste in form of solid pomace. Apple pomace make up 25% of total apple weight and are often discarded as a waste product of fruit juice processing and other apple-related products (Kruczek *et al.*, 2017). Apple pomace powder can be utilized as an improved substitute of wheat flour due to its high dietary fiber content (Sudha *et al.*, 2007). Previous studies showed that apple pomace substitution using *Gala* and *Golden Delicious* apple cultivars have comparable properties to wheat flour biscuits when substituted in 5% concentration (Kohajdová *et al.*, 2014). In cake production, 30% of wheat flour was replaced with apple pomace powder and had acceptable sensory properties with the additional product benefits of having strong desirable fruity taste and becoming a good source of fiber (Sudha *et al.*, 2007).

Another alternative for fat substitute in baked products is sunflower seed butter. Sunflower seed butter contains high percentages of fats and protein. It is also an excellent source of vitamin E, and several minerals such as phosphorus, magnesium, copper, manganese, and selenium. When compared to pure vegetable oil, sunflower seed butter contains significantly more protein and minerals which could improve nutritional quality of baked products. Compared to conventional peanut butter, they contain significantly more monounsaturated fats (Thomas and Gethardt, 2010). However, product application of sunflower seed butter is limited compared to other nut-based butters such as peanut butter and almond butter due to a slight metallic aftertaste of sunflower seed butter (Wildermuth *et al.*, 2016; Kaur and Maruf, 2018).

This study focuses on the application of apple pomace powder (AP powder) as wheat flour (WF) substitute and sunflower seed butter (SFS butter) as vegetable oil (VO) substitute, and the ideal substitution proportion in waffle cone production. Previous studies of wheat flour substitution using MOCAP had a drawback of reducing overall acceptance of panellist based on its taste and hardness (Diniyah *et al.*, 2019). The application of apple pomace powder can avoid this problem due to fruity aroma and taste of apple pomace powder when applied in baked goods (Sudha *et al.*, 2007). The application of apple pomace powder in other baked products such as cakes was shown to reach maximum substitution percentage of 30% due to problems with product texture and color (Sudha *et al.*, 2007). Therefore, waffle cones were chosen as selected product to

increase apple pomace substitution percentage beyond 30% due to its naturally brown color and hard texture.

## 1.2 Research Problem

Waffle cones have high fat and carbohydrate content but does not provide any additional nutritional benefits other than being a source of energy. The use of functional foods such as apple pomace powder and sunflower seed butter has the potential to increase overall nutritional benefit and impart fruity characteristics to waffle cones.

Apple pomace is an underutilized waste product of apple juice processing although it is an excellent source of fiber with 51.1% fiber content (Sudha *et al.*, 2007). The utilization of local apples produced in Indonesia is limited compared to imported apples. Previous studies of replacing wheat flour with apple pomace powder had been limited to a maximum of 30% in cakes due to undesirable change in color and hardness.

Sunflower seed butter as an oil substitute has the potential to decrease fat content, which decreases calories of waffle cones, while replacing saturated fatty acids with unsaturated fatty acids and retain desirable hardness and crispiness of waffle cones. However, minimal studies had been done to implement their benefits into a product while maintaining acceptable taste and texture.

Therefore, a balance between apple pomace powder and sunflower seed butter percentages need to be evaluated to produce waffle cones that have desirable sensory characteristics as well as physical characteristics with a decrease

in fat content by SFS butter substitution and increase in dietary fiber content by AP powder substitution.

### **1.3 Objectives**

#### **1.3.1 General Objectives**

The general objective of this research is to utilize *Manalagi* apple (*Malus sylvestris* Mill.) pomace powder as wheat flour substitute and sunflower (*Helianthus annuus* L.) seed butter as a substitute for vegetable oil in the production of waffle cones.

#### **1.3.2 Specific Objectives**

The specific objectives of this research are:

1. To obtain AP powder and its characteristics based on moisture content, fat content, protein content, carbohydrate content, dietary fiber content, hue and lightness.
2. To obtain SFS butter and determine its fat content.
3. To determine best combination of SFS butter and AP powder percentages to produce waffle cones with acceptable sensory characteristics, as well as physical characteristics.
4. To evaluate characteristics of best waffle cone formulation based on fat content, and dietary fiber content.