Chapter 1

Introduction

1.1 Background

The Indonesian flavored drinks market is expected to grow at a compound annual growth rate (CAGR) of 2.9% up until 2030 (GVR, 2024), and flavor as a part of the ingredient is the essential aspect in determining the food and beverage quality (Vilela, 2021). When added to food or beverage products, flavors are able to mask the unpleasant taste or odor present in them as well as increase customers' acceptance towards the product (R et al., 2022; Sung et al., 2025). Flavorings are mainly made up of propylene glycol (PG), the most widely used flavor solvent, that are relatively more stable in comparison to the other solvent types (Yang et al., 2013). Although PG is classified as a GRAS food additive, there are limitations to the utilization of PG by the Indonesian FDA, which was only 1000 mg/kg in beverages (BPOM, 2020).

PG could be commercially produced from petroleum, a long-chain hydrocarbon through a steam cracking process into a shorter hydrocarbon chain such as propylene and ethylene (Vandana et al., 2022). These short hydrocarbon chain produced then undergoes series of reactions including selective oxidation into hydrocarbon oxide and then hydrogenolysis of the glycerol into a hydrocarbon glycols such as the propylene and ethylene glycol (Farsalinos, 2021; Mitta et al., 2018). The separation of the propylene and ethylene glycol that is produced together are preferable through reactive distillation (RD) process as both have different boiling points (Dhale et al., 2004; Wang et al., 2019). However, there is still a risk of PG adulteration or contamination with EG or DEG like the case happening in the Liviandari & Husni (2023) that concerns the safety of customers as both of these are toxic for the body, with a lethal dose of EG ranging between 1.4-1.6g/kg of body weight (Iqbal et al., 2022; Li et al., 2011).

These challenges could be faced by introducing another solvent that has low toxicity and price, one of which is ethanol (Cayot, 2014). Nonetheless, using ethanol as a solvent may cause the volatile compounds present in flavors to evaporate easily, as the vapor pressure of ethanol is higher than that of distilled water (Ahumada-Lazo & Chen, 2023; Liu et al., 2008). Hence, flavor stability has increased in attention, as throughout time flavor may deteriorate, which may influence the quality of the product (Maia et al., 2021). As a result, the stability of flavor throughout time could be assessed using ASLT, where product samples are exposed to extreme temperatures that lead to a shorter time for testing required (Li et al., 2023). Flavor analysis in studying shelf-life of the samples could be conducted through sensory analysis, as it is highly reliable and could examine the perceived attributes (Chambers & Koppel, 2013).

Therefore, this study aimed to analyze the effect of the storage temperature and reduction of propylene glycol on the shelf-life of lychee flavors. The physicochemical analyses conducted would include refractive index and specific gravity, as well as sensory evaluation for the magnitude of differences.

1.2 Objective

The objective of this study is to observe the changes and assess the relationship between different storage temperature on changes of the physical and sensory properties of lychee flavors with reduced propylene glycol concentration to be used in estimating the shelf-life

1.3 Hypothesis

The hypotheses for this study would include:

- H_0: The reduction of PG content in lychee flavors does not affect the shelf-life in terms of the physicochemical characteristics and sensory properties
- H_1: The reduction of PG content in lychee flavors affects the shelf-life in terms of the physicochemical characteristics and sensory properties