Chapter 1

Introduction

1.1 Background

Boba pearls initially originated from Taiwan, but have become a popular snack enjoyed worldwide among children, teenagers, and even adults due to their chewy texture and sweet flavor (Juliana et al., 2022). It is usually served as a topping in several desserts and beverages including in tea based beverages, ice cream, pancake, etc. Generally, boba is made from tapioca starch, a product extracted from cassava roots (Bayata, 2019). Cassava is a common dietary staple with high starch content, however it has relatively low protein content which is only 1.9 g in a 100 g serving (Scaria et al., 2024). Nowadays, the trend of higher protein food alternatives are increasing as consumer shifts towards healthier lifestyles and diets. Therefore, incorporating high protein flour into boba pearl presents a promising solution to meet this demand and to enhance its overall nutritional benefits.

Red kidney beans (RKB) are one of the legume varieties of kidney bean classifications which belong to *Phaseolus vulgaris L.*. This widely produced legume provides an enormous amount of macronutrients and essential micronutrients (Abirami & Kaur, 2023). RKB in general consists of 23.6 g of protein per 100 g serving. This bean provides a great source of protein compared to other legumes such as chickpeas and pinto beans which only consist of 20.5 g and 5.25 g, respectively. Besides the consumption as a meal, red kidney beans are usually processed into flour as it can be utilized as an additional source of protein in several types of food. Due to its gluten free and vegan friendly properties, RKB flour is commonly used as a substitute to other flour. For that reason, flour from red kidney beans could be an ideal candidate to enhance the nutritional value of boba pearls for consumers who seek healthier diets. Despite this, the drawback of adding RKB flour to food is the beany taste which might interfere with the product's overall flavor. Some pre-treatments have been

shown to reduce the undesirable taste and aroma of legume flours, while also enhancing its functional and nutritional values.

One of the pre-treatments that has been applied for beans in the making of legume flours is the application of thermal treatment prior to milling (Carboni et al., 2024). Generally, heating methods are largely divided into two groups, moist–heat and dry-heat methods (Choe et al., 2022). Referring to previous studies, heat treatments of beans using oven, microwave, and boiling methods could retain the nutritional content and enhance functional properties of the final red kidney bean flour product (Chompoorat et al., 2018; Li et al., 2024; Roy et al., 2021; Sheikh et al., 2025). In addition, heat treatment is effectively proven to improve the sensorial characteristics of legume flours through the inactivation of oxidation catalyze enzymes which causes off-flavors (Shi et al., 2020).

The study about the effect of heat treatments towards red kidney bean flour characteristics are still limited. Therefore, this research aimed to examine the proximate composition and functional properties of RKB flour produced by different heat treatment methods. By exploring those key aspects, the study was expected to provide insights into the feasibility and potential benefits of heat treated beans in food application. Additionally, the overall sensorial and physicochemical characteristics of boba pearls made from RKB flour were examined as well. This study pursued to support the development of healthier alternatives to traditional boba products and catering to the growing consumer preference for functional and nutritious food options.

1.2 Objective

The objectives of this study were to:

a. Examine the physicochemical and functional properties of red kidney bean flours that are treated with 4 different heat treatments.

b. Incorporate red kidney bean flour to enhance protein value of boba pearls and conduct several analyses to compare the sensorial and physicochemical properties of boba pearls made from different heat treated red kidney bean flours.
c. Compare the proximate composition between tapioca and red kidney bean boba pearls.

1.3 Hypothesis

The hypothesis for this project were divided into 2 sections as listed below:

1.3.1 Heat Treated Red Kidney Bean Flour Production

H_0 = There is no significant difference in terms of physicochemical and functional properties values of red kidney bean flours treated with different heat treatments.

H_1 = There is significant difference in terms of physicochemical and functional properties values of red kidney bean flours treated with different heat treatments.

1.3.2 Development of Red Kidney Bean Boba

H_0 = There is no significant difference in terms of the physical properties of boba made from different heat treated red kidney bean flours.

H_1 = There is a significant difference in terms of the physical properties of boba made from different heat treated red kidney bean flours.

H_0 = There is no significant difference in terms of the consumer liking of bobas made from different heat treated red kidney bean flours.

H_1 = There is significant difference in terms of the consumer liking of bobas made from different heat treated red kidney bean flours.

H_0 = There is no significant difference in terms of the proximate values of tapioca boba and red kidney bean boba.

H_1 = There is a significant difference in terms of the proximate values of tapioca boba and red kidney bean boba.