CHAPTER 1: INTRODUCTION

1.1 **Background**

One of the current major global health concerns is excessive salt and sodium intake. Excessive intake of sodium is associated with high blood pressure, which may lead to cardiovascular disease, heart failure, stroke and potentially death. Moreover, excessive intake of sodium also negatively affect kidney function, eventually causing kidney failure (Cepanec et al., 2017; Jaramillo, 2017). The World Health Organization (WHO) has set a target of less than 5 g of salt consumption per day. However, the general population consumes an average of 9 to 12 g of salt per day; the population of Thailand is no exception to this as according to WHO (2017), the average Thai person consumes 10.8 g of salt per day, which is equivalent to around 4200 mg of sodium (more than double the recommended daily intake for sodium). In an effort to tackle this problem, many countries around the world, including Thailand, have developed national strategies to reduce the amount of salt and sodium consumption in their populations. The Thai government developed its strategy with the aim of reducing the population sodium intake by 30% by 2025 (Jaramillo, 2017).

Pla-ra is one of the many traditional fermented foods consumed in Thailand; it originated from Northeastern Thailand and is usually made by fermenting salted fresh water fish or marine fish and ground roasted rice or rice bran. The production of *Pla-ra* in Thailand was estimated to be around 20,000-40,000 tons/year in the early 2000s and the consumption of *Pla-ra* in Thailand was estimated to be around 260,000 tons per year, with each person consuming around 419 g of *Pla-ra* per year. (Sangjindavong et al., 2008; Ngeoywijit & Kruasom, 2013). *Pla-ra* is popular in Northeastern Thailand and is usually eaten as it is or incorporated in dishes such as papaya salads (*Som Tam Pla-ra*), minced pickled fish (*Pla-ra Sub*), and chili sauce (*Nam phrik Pla-ra*) due to its strong flavor and odor (sangjindavong et al., 2008; Kristbergsson & Oliveira, 2016).

In the early 2000s, the average economic value of *Pla-ra* in Thailand alone was estimated to be around 800 million Baht per year (equivalent to around 26 million USD) and the average economic value of *Pla-ra* which were exported to other countries was estimated to be around 20 million Baht per year (equivalent to around 650 thousand USD) (Vischasilp, Sangjindavong, & Wilaipun, 2008). Presently, there are a variety of commercial product in Thailand that are made up of *Pla-ra* or contain *Pla-ra* as their main ingredient such as *Pla-ra* papaya salad dressing, concentrated *Pla-ra* sauce powder and bottled *Pla-ra* sauces with the addition of a variety of different ingredients and additives; the development of these products indicate that the demand for *Pla-ra* and *Pla-ra* based products in Thailand is still high. *Pla-ra* products across Thailand is known to have different characteristics and flavor profiles due to the different types of *Pla-ra* used in the product and also the variety of ingredients added into the product; some of the common ingredients added to *Pla-ra* products are sugar, shrimp paste, pickled garlic, and monosodium glutamate (MSG).

Pla-ra is known to be a product which is relatively high in salt content; according to the Thai National Bureau of Agricultural Commodity and Food Standards (2018), *Pla-ra* should have a minimal salt content of 18% by weight and according to Jaramillo (2017), data from the 2016 Thai Food Composition Tables published by Mahidol University's Institute of Nutrition showed that *Pla-ra* is one of the condiments with the highest sodium content, with an average of 6267 mg sodium per 100 g. The development of a low-sodium *Pla-ra* sauce product is therefore a good opportunity to help lower the sodium intake of Thai people as *Pla-ra* is widely consumed in north and northeastern Thailand.

1.2 **Objective**

The objectives of this thesis research are to characterize the physical, chemical, and sensory properties of commercial *Pla-ra* products found in Khon Kaen and surrounding areas as well as to develop a low-sodium *Pla-ra* sauce with an acceptable sensory quality and physical and chemical properties comparable to commercial *Pla-ra* sauce.

1.3 **Scope of Research**

The scope of research of this thesis includes characterization of the physical and chemical properties and sensory characteristics of commercial *Pla-ra* sauces in order to determine the "ideal" or desirable properties and characteristics of a *Pla-ra* sauce as well as development of a low-sodium *Pla-ra* sauce using KCl and Glycine as salt replacer. Physical and chemical analysis were conducted followed by grouping of samples based on their physical and chemical properties. Representatives of each group was selected and sensory analysis, which includes Check-all-that-apply (CATA), attribute intensity rating, and ranking tests, were conducted on the samples. Product formulations was conducted for the low-sodium *Pla-ra* sauce followed by physical and chemical analysis, saltiness intensity test, and sensory preference test.

1.4 **Benefits of Research**

This research can act as a preliminary study for future studies that would like to optimize the formulation for low-sodium *Pla-ra* sauce. This research can also be used as a reference for commercial *Pla-ra* producers that would like to manufacture regular or low-sodium *Pla-ra* sauces.