

CHAPTER I

INTRODUCTION

1.1 Background

Bread has become a staple food product worldwide as it provides sufficient balance of macronutrients. Bread-making consist of stages like mixing, dough resting, shaping, proofing, and baking resulting in a variety of bread products. Bread is generally made out of a mixture of wheat, salt, yeast, and water (Russell, 2011). Pan bread, also commonly known as sliced bread or loaf bread is a type of bread products to which the dough is baked in a loaf pan and without the addition of flavourings where, wheat flour highly contributes to the structure of bread (Cauvain and Young, 2007; Ishida and Steel, 2014).

According to *Badan Pusat Statistik*, by the year 2020, Indonesia has imported as much as 10,299,699 tons of wheat with an increasing trend in imported wheat flour at around 30,000 tons. This amount of imported wheat and wheat flour is considered high and is sufficient to show Indonesia's dependency on wheat and wheat flour (BSN, 2022; Laoli, 2017). Thus, an attempt to provide a solution to this wheat flour dependency by substitution of wheat flour with another flour with potential alternative.

Gembili (*Dioscorea esculenta* L.) is a type of Indonesian tubers that can mostly be found in the forest. It is a type of plant that bears fruit underground, and the tuber grows vines that may reach between 3 to 5 m with green leaves and visible thorny stems around the tubers. Gembili can be further processed into flour and can be incorporated to food products as it is a source of carbohydrate, protein, calcium, phosphorus, potassium, iron, dietary fiber, vitamin B6, and vitamin C. It is also low

in fat and is anti-hyperglycaemic. However, gembili is not a cultivated staple crop due to its limited utilization (Harijono *et al.*, 2010; Richana and Sunarti, 2004; Sabda *et al.*, 2019).

In breadmaking, the substitution of wheat flour with gembili flour may cause the loaf volume to be relatively lower than breads fully with made with wheat flour where, during storage the bread continues to deflate as a result of lack of gluten that is responsible for dough rise in bread (Ukpabi, 2010). Modifications must be done towards gembili flour as substitution of wheat flour with untreated gembili flour results in poorer characteristics of bread.

Heat-moisture treatment (HMT) is a method that is used to physically modify flour by altering the functional properties and starch structure of it. HMT also allows starch to be more resistant towards high heat processing (Gunaratne, 2018). A study by Pokatong and Julista (2022) shows that pan bread made by partial substitution of wheat flour with HMT-treated sweet potato results in a better swelling power than the pan bread made fully using wheat flour.

1.2 Research Problem

Being the main ingredient in breadmaking, wheat flour is still highly imported. As an attempt to reduce this dependency, substitution of wheat flour using local ingredients like gembili could be done by simultaneously increasing the utilization of gembili by processing it into flour. In spite of that, partial substitution of wheat flour may result in a relatively lower volume of bread as a result of reduced amount of gluten. That being the case, Heat-Moisture Treatment could be done to modify gembili flour in order to improve the swelling power to provide a better

volume in the making of bread using the sponge dough method, as modification is able to compensate some roles of gluten in pan bread. Henceforward, there has not been any research conducted to study effect of HMT on gembili flour in the making of pan bread. It was expected that heat-moisture treated gembili flour used in partial substitution of wheat flour in the making of pan bread using sponge dough method, may improve its swelling power. Thus, this research was conducted to study and determine the most suitable time and temperature for HMT in modifying gembili flour, and used this modified flour in the making of pan bread to determine the best ratio of wheat flour to modified gembili flour assumed from the better organoleptic and physicochemical characteristics of partially substituted pan bread to the pan bread fully made using wheat flour.

1.3 Objectives

1.3.1 General Objectives

This research aimed to investigate the utilization of gembili flour modified with Heat-Moisture Treatment (HMT) as a substitute for wheat flour with regard to the organoleptic and physicochemical characteristics of pan bread made using sponge dough method.

1.3.2 Specific Objectives

The specific objectives of this research were to:

1. Prepare gembili flour and modify it with Heat-Moisture Treatment (HMT).
2. Determine effect of time and temperature of Heat-Moisture Treatment (HMT) on characteristics of that modified gembili flour in terms of swelling power, solubility, and lightness, and to select the best treatment.

3. Determine effect of ratio of wheat flour to the selected HMT modified gembili flour on physicochemical and organoleptic characteristics of pan bread made with sponge dough method, and to select the best formulation.

