I. INTRODUCTION

1.1 Background

Obesity is a major health problem worldwide, as the World Health Organization (WHO) predicts that the adult population worldwide will be obese in the future. Therefore, it must be addressed immediately. In fact, a 2014 survey revealed that 1.9 billion adults (39%) aged 18 and over were overweight. The prevalence of obesity in Indonesia in 2013 was 32.9% in women aged over 18 years, while in Padang it reached 39.7% (Sinaga *et al,* 2018).

Dietary intake plays an important role in preventing the development of metabolic diseases such as obesity and diabetes. In contrast, a high-fat diet (HFD) is able to increase inflammation in tissues including insulin target tissues (liver, adipose, and muscle) which causes insulin resistance as is common in type 2 diabetes mellitus (DMT2) (Santoso *et al,* 2021).). In addition, various chronic degenerative diseases for obese people such as hypertension, coronary heart disease, stroke, cancer, and bone disorders are among the continued effects driven by insulin resistance (Muhammad, 2018; Paleva, 2019). Due to the many diseases caused by obesity and T2DM, the morbidity and mortality rates in patients are very high (Siedel *et al,* 2015).

Dietary fiber from certain plants is suggested to have a preventive effect on metabolic diseases. According to The Food Standards Australia New Zealand (FSANZ, 2002), dietary fiber is defined as the fraction of edible plant parts that are resistant to digestion and absorption in the human small intestine, usually having to undergo complete or partial fermentation in the human large intestine. Consumption of foods that contain lots of fiber is known to reduce fat absorption, increase plasma insulin concentrations and reduce hyperglycemia levels on the Oral Glucose Tolerance Test (OGTT) (Lovejoy and DiGirolama, 1992).

Based on a study conducted by Weickert and Pfeiffer (2015) showed that dietary fiber has been shown to prevent obesity caused by high-fat foods through modulation of the gut microbiota. Microbiota in the digestive tract will ferment fiber into products known as short chain fatty acids (SCFAs). SCFA will enter the

circulatory system which in turn activates various body systems, especially the pancreas, liver, muscles, and brain (Wangko, 2020). In addition, SCFAs have been reported to stimulate insulin secretion in pancreatic beta cells. Another study conducted by Wang *et al,*. (2012) showed that the incorporation of dietary fibers such as sugarcane fiber and psyllium can effectively improve insulin sensitivity, reduce excessive weight gain, and modulate the secretion of metabolic hormones, especially glucagon-like peptide 1 (GLP-1) in mice fed with HFD. In addition, fiber can increase leptin and increase proglucagon gene expression in the mouse ileum. Meanwhile, research on jicama fiber as an antidiabetic was conducted by Santoso *et al,*. (2021), who used a 25% dose of jicama fiber, showed a significant preventive effect of fiber on pancreatic degeneration and increasing blood glucose levels. This suggests that jicama fiber is a potential supplement to counter the development of diabetes mellitus and related metabolic disorders.

Phytochemicals contained in plants have a very large role in influencing cell signaling, such as research that has been done by Song *et al,* (2000) the terpenoid group is able to modulate the activity of ligand-dependent transcription factors, namely, proliferator-activated receptor (PPAR). Since PPARs are dietary lipid sensors that control energy homeostasis, daily consumption of terpenoids could be useful for ameliorating obesity-induced metabolic disorders, such as type 2 diabetes, hyperlipidemia, insulin resistance, and cardiovascular disease. According to research by Fabroni *et al,* (2016) which said that the content of bioactive compounds in certain tubers could have the potential as anti-obesity with bepreans as inhibitors of enzyme performance, such as the content of antioxidant compounds such as anthocyanins in purple sweet potato (*Ipomoea batatas* L. Poir) which can inhibit the action of the lipase enzyme in the intestine, thereby reducing the absorption of fat.

Based on the fiber content and phytochemicals, there are various other food plant tubers that have the potential to be used as alternative foods to treat obesity and type 2 diabetes mellitus. In addition to containing fiber, jicama also contains flavonoids and various other substances such as saponins, isoflavones of the daidzein type, stigmasterol, -sitosterol, and various other substances that play a role in reducing cholesterol levels in the blood (Atma *et al,* 2013) and and preventing

insulin resistance (Santoso *et al*, 2021). The research of Santoso *et al*, (2019) reports that jicama fiber can prevent obesity and diabetes in mice fed a high sugar diet, Meanwhile, giving jicama fiber at a dose of 25% in mice fed a high fat diet can suppress excess weight gain. , prevent an increase in white adipose tissue weight (WAT), prevent white adipose cell hypertrophy (WAT), prevent an increase in total cholesterol levels and LDL cholesterol levels (Fadhilah, 2019).

Based on the described background, a study is needed to clarify how the effect of dietary fiber and bioactive compounds from these jicama tuber on the GLP-1 hormone. This study is expected to elucidate the mechanisms underlying the effects of dietary fiber and bioactive compounds on GLP-1 on HFD-induced obesity and related metabolic disorders.

1.2 Problem Formulations

Based on the background that has been described, the problem formulations that will be studied are:

1. How does the effect of Jicama fiber in HFD on GLP-1 hormone levels?
2. What are the bioactive compounds in jicama fiber that function as GLP-1 Receptor Agonist?

1.3 Research Objectives

Based on the proble formulations above, the objectives of this study are:

1. To determine the effect of Jicama fiber in HFD on GLP-1 hormone levels
2. To determine the bioactive compounds in jicama fiber that function as GLP-1 Receptor Agonist

1.4 Benefits of Research

The benefits of this study are to provide information about the potential of dietary jicama fiber (*P. erosus*) as the alternative supplementary food to prevent and treat metabolic diseases, especially obesity and type 2 diabetes mellitus and to increase the user value and economic value of tubers fiber use.