I. INTRODUCTION

1.1 Background

A high-fat diet (HFD) is one of detrimental factors contributing in epidemic of obesity (Picchi, 2011). Obesity is closely associated with the development of other health problems including cardiovascular disease and diabetes, accompanied by elevated triglyceride levels and low high density lipoprotein cholesterol levels (Marques, 2016). According to Wang *et al*. (2012) obesity is developing when the energy intake exceeds energy expenditure of the body. Studies show that obesity increases various comorbid diseases such as type 2 diabetes, hypertension, hypercholesterolemia, hypertriglyceridaemia, and non-alcoholic fatty liver disease (Ogden *et al*., 2007; Hurt *et al*., 2010; Aucott 2008).

Dietary fiber has been shown to exert a preventive effect against obesity. Several studies have proven that increasing dietary fiber intake could reduce an excessive increase in body weight (Tucker *et al*., 2009; Bahadoran *et al*., 2013; Grooms *et al*., 2013). According to Nurhamidah (2010), dietary fiber takes the long time to be digested in the stomach. Hence, dietary fiber prolongs satiety thereby preventing food intake. Moreover, a diet sufficient in fiber content reduces the digestibility of carbohydrates and subsequently precludes blood glucose increase. Such findings suggest that consumption of dietary fiber profoundly promotes various health benefits particularly reduction of the risk in having metabolic diseases.

One of the potential tuberous plants known for its nutrient contents and medicinal benefits against metabolic diseases is jicama (*Pachyrhizus erosus* L., Fabaceae) (Buckman *et al*., 2017; Noman *et al*., 2012). A study revealed that Jicama extract could inhibit the activity of the α-glucosidase enzyme thereby reduce

postprandial blood glucose elevation (Santoso, Amelia & Rahayu., 2019). Jicama is one of the most popular commodities and grown in many sub-tropical and tropical regions, including Indonesia (Noman *et al*., 2007). Jicama is rich in fructooligosaccharides including inulin, which is fiber soluble in water, not digestible by digestive enzymes, however, fermented by colonic microflora (in the large intestine). Inulin is sometimes referred to as natural insulin because it could regulate blood glucose levels (Park & Han, 2015). Inulin supplementation could suppress the expression of hepatic genes involved in lipogenesis and the development of fatty acids (Weitkunat *et al*., 2015).

The material potential of sugarcane fiber (Wang *et al*., 2012) and bamboo shoot fiber (Li *et al*., 2016) as a drug for metabolic disorders has been reported, however, the dietary fiber composed of jicama tuber remains less to be studied. Based on the previous research, it has been confirmed that jicama exerts an immunomodulatory effect (Kumalasari, 2014). Jicama extract could increase insulin sensitivity, lower blood glucose levels in hyperglycemic mice (Park & Han, 2015) and prevent platelet aggregation in humans (Thaptimthong *et al*., 2016). Another study revealed that jicama fiber effectively precluded random and fasting blood glucose levels and sustained glucose tolerance of high fat diet-feed in mice (Santoso, 2021). Previous report also demonstrated that the extract of jicama fiber significantly decreased blood glucose levels and glycosylated hemoglobin as well as inhibited gluconeogenesis in the liver (Park and Han, 2015).

Fibroblast growth factor 21 (FGF21) is hormone that has profound effects on metabolic regulations such as glucose and lipid homeostasis and rapid body weight loss in obese (Emanuelli *et al*., 2015). Fibroblast growth factor 21 (FGF21) is an

endocrine hormone that belongs to the FGF family and is mainly expressed in the liver (Nishimura *et al*., 2000). According to Lin. (2017), FGF21 is involved in glucose and lipid metabolism, and contributes significantly to lowering body weight and enhancing insulin sensitivity. However, it is unclear whether Jicama fiber is effective to increase FGF21 that associated with insulin sensitivity of mice particularly those fed with a HFD.

Insulin plays a pivotal role in regulating blood glucose. Insulin will promote satiety and increase energy expenditure in the tissue of the body (Paz-Filho *et al*., 2012). However , until recently, it is unknown whether Jicama fiber could increase insulin sensitivity especially under HFD regimes. This current study focused on the investigation of beneficial effects of Jicama fiber on the expression and levels of FGF21 and Insulin in mice fed with HFD.

1.2 Problem Formulation

1. How does the effect of Jicama fiber in HFD on blood glucose, insulin tolerance, and insulin level in mice ?
2. How does the effect of Jicama fiber in HFD on FGF21 level in mice ?
3. How does the effect of Jicama fiber in HFD on the FGF21 mRNA expression level in liver in mice ?

1.3 Research Objectives

1. To analyze the effects of Jicama fiber in HFD on blood glucose, insulin tolerance, and insulin level in mice
2. To analyze the effects of Jicama fiber in HFD on FGF21 level in mice
3. To analyze the effects of Jicama fiber in HFD on the FGF21 mRNA expression level in liver in mice

1.4 Research Benefit

The benefits of this research are to provide information in science regarding the potential for dietary fiber of the jicama (*Pachyrhizus erosus* L.) as an alternative medicine for the prevention of metabolic diseases, especially obesity so that it can increase the use - value and economic value of jicama fiber.