CHAPTER I. INTRODUCTION

1.1 Background

Inflammatory bowel disease (IBD) is one of the diseases that is closely associated with the emergence of colorectal cancer, IBD have two-fold risk of developing colorectal cancer (Rawla, 2019). Colorectal cancer is a malignant tumor that appear at colon or rectum especially in epithelial tissue, and it commonly occurs in people over the age of 50-64 and is usually caused by diabetes and obesity. (Rawla, 2019). One of the causes of IBD is the excessive consumption of high-fat foods (Sairenji, 2017). A High Fat Diet is Diet consisting of at least 35% of total calories is consumed from fatas, both unsatuteated and saturated (Olson *et al.,* 2010). Medical treatment for patients with mild to moderate IBD is the oral administration of aminosalicylates, which is the first line of therapy, administration of chemical drugs such as aminosalicylates has side effects such as nausea, vomiting, diarrhea, and headache. Corticosteroid use such as dexamethasone, betamethasone, prednisone, and other types of corticosteroid drugs can lead to obesity, acne, hypertension, diabetes, bone mass loss, and an increased risk of infection in the long run (Seyedian, 2019). Research shows that IBD can also be triggered by the consumption of non-steroidal anti-inflammatory drugs (NSAID) likeaspirin, indomethacin, mefenamic acid, and there are several other types. Anti-inflammatory chemical drugs have been shown can rises number of *Reactive Oxygen Species* (ROS) or free radicals can trigger rises number of malondialdehyde (MDA) levels in the body, thereby promoting inflammation. ROS are oxygen and its derivatives that are highly reactive because they have unpaired electrons in their outer orbitals. ROS will later interact with fatty acids, and fat peroxidation reactions will occur that cause fatty acid chain breaks to become toxic compounds, one of which is MDA, a metabolite resulting from lipid peroxidation that is an indicator of oxidative stress (Yunus, 2001). Thus, the use of chemical medications for patients with IBD causes many harmful negative side effects.

In order to find alternatives to chemical drugs for IBD, several alternatives have been developed, such as herbal therapy based on ethanol and methanol extracts of *Flos lonicerae* (tea species) and methanol extracts of *Rhizoma bletillae* (orchid

species). These natural ingredients are known to be rich in polyphenols, which act as antioxidants (Wu *et al*., 2010). Apart from the extracts of various plants, another potential way to overcome IBD is with tuber-based functional foods. In some previous studies, one type of root tubers was used, namely the Purple Banggai Uwi plant (*Dioscorea alata L*.), which also contains flavonoid compounds as anti-inflammatory (Khaerati, 2017).

Another corms vegetable species with potential as a functional food is taro (family Araceae). Taro tubers are rich in resistant starch, fiber, and bioactive compounds with high medical potential, such as polyphenols and saponins (Wijaya, 2014). The content of fiber, raffinose, and resistant starch allows taro tubers to be developed as prebiotics that can maintain gastrointestinal health (Sajilata, 2006). Resistant starch is starch that cannot be digested by small intestine digestive enzymes and thus becomes a fermentation substrate for microflora in the large intestine. Fermentation activity will produce more of *short-chain fatty acids* (SCFA), especially acetate, butyrate, and propionate. SCFA, which is the result of carbonhydrate fermentation, mostly contains acetic acid, propionic acid, and butyric acid. SCFA have been reported to prevent the occurrence of colon cancer by increasing the cytotoxic activity of cancer cells. SCFA also have crucial role in maintaining the integrity of intestinal epithelial cells so that they are less prone to degeneration. Other studies have shown that modified taro flour can be used as a functional food ingredient in the form of synbiotic taro yogurt (Ramirez *et al*., 2013). The prebiotic components (fiber, resistant starch, oligosaccharides, and others) contained in the modified taro flour will be used by probiotic bacteria as a carbon source in the colon. The result is produce more number of probiotics in the colon and a decrease in pathogenic bacteria, thus reducing the risk of gastrointestinal inflammation (Ramirez *et al*., 2013).

Although exploration of the medical potential of taro tubers of various species and varieties has been conducted in Indonesia, scientific information regarding the medical properties of Mentawai taro tubers (talas Mentawai) is still very limited. A study conducted by Hirwanto (2022) found that supplementation of fiber, starch, and whole flour from Mentawai taro tubers was effective in preventing obesity and elevating blood cholesterol levels in mice fed a high-fat diet. Phytochemical analysis using gas chromatography found several potential bioactive compounds such as astaxanthin and fatty acids such as Octadecenoic Acid and Lauric Acid in flour, fiber,

and starch preparations of Mentawai taro tubers, this is also evidenced by previous research that there are differences in Mentawai taro preparations in the form of flour, starch, and fiber that contain different compounds and have dominant compound values in each difference in preparation, Therefore, the three dosage forms need to be tested further as anti-inflammatory agents and are thought to have different effectiveness because they have different phytochemical content. (Hirwanto, 2022; Santoso, 2022). However, whether flour, fiber, and starch preparations from Mentawai taro tubers are also efficacious in preventing IBD due to high-fat foods is not yet known. In addition, specific studies using an in silico approach to model the mechanism of action of active substances in Mentawai taro tubers in preventing IBD have not been conducted. Therefore, a study that combines in vivo (with animal testing) and in silico (with computer modeling) approaches is important to be conducted in order to explore the medical potential of Mentawai taro as one of Indonesia's local resources.

1.2 Problem Formulation

The problem formulations in this study are:

1. Can the addition of mentawai taro corms preparations in the form of flour, fiber, and starch in high-fat feed prevent histopathological changes in the colon as an indicator of IBD in animal models of white mice?
2. Can the addition of Mentawai taro corms preparations in the form of flour, fiber, and starch in high-fat feed also suppress the accumulation of malondialdehyde (MDA) as an indicator of free radicals in the colon in mice fed a high-fat diet?
3. What are the bioactive compounds in Mentawai taro corms preparations that have the potential to intervene in cellular signaling systems related to the development of IBD based on in silico simulations?

1.3 Research Objectives

This research aims to :

1. Determine the effectiveness of Mentawai taro corms preparations in the form of whole flour, fiber, and starch in preventing changes in colon histopathology as an indicator of IBD in mice fed a high fat diet.

2. Determine the effectiveness of Mentawai taro corms preparations in the form of whole flour, fiber, and starch in preventing the accumulation of MDA in the colon as an indicator of free radicals in mice fed a high fat diet.
3. Identify bioactive substances in Mentawai taro corms preparations. deep potential for intervening in cellular signaling systems related to the development of IBD based on in silico simulation

1.4 Research Benefits

The results of this study are expected to be used as a source of knowledge and information for the public regarding the efficacy of Mentawai taro flour, fiber, and starch in preventing disease development due to a high-fat diet, especially IBD.