I. INTRODUCTION

A. BACKGROUND

Sweet potato (*Ipomoea batatas*) is an alternative food rich in starch. In Indonesia, economical value of sweet potato is low, compared with other starch sources. However, the sweet potatoes which are rich in starch made it a potential source of resistant starch. At present, various studies about resistant starch had been conducted. Recent studies showed that resistant starch consumption may reduce colorectal cancer risk.

Resistant starch has been defined as total amount of starch, and the products of starch degradation that resists digestion in the small intestine of healthy people. There are four types of resistant starch. Type 1 resistant starch (RS1) is starch that escapes digestion in the small intestine due to physical protection by the food matrix, such as grains. Type 2 resistant starch (RS2) is raw starch granules (ungelatinized) with compact structure which limits accessibility of digestive enzymes. Type 3 resistant starch (RS3) is retrograded starch in which parts of the starch chains can crystallize into components that are less digestible. Most often, this occurs by cooking and cooling starch-containing foods. And the last, type 4 resistant starch (RS4) is not found naturally in foods. Starch that has been chemically modified to introduce bonds that are not digestible by human enzymes.

Starches that resist small intestinal breakdown are fermented by the resident bacteria in the large intestine, producing a variety of end products, the most significant of which is the short chain fatty acids (SCFA). SCFA, especially butyrate maintenance of colonic health and barrier function, butyrate has drawn most attention as this fatty acid is the major energy source for the colonocytes (Roediger 1990). Furthermore, butyrate has been shown to have anti-carcinogenic effects mainly by affecting proliferation, differentiation and apoptosis of colonocytes (Scheppach, *et. al* 1995).

There are several bacterial species which produce butyric acid. It is an anaerobic process. The genera *Clostridium*, *Butyribacterium*, and *Butyrivibrio* are the mostly studied microorganism. For commercial purposes, *Clostridium* species are preferred for butyric acid production. *C. butyricum*, *C. tyobutyricum*, *C. thermobutyricum*, *C. beijerinckii*, and *C. populeti* are of interest for the production of butyrate. Purwani, *et. al* (2012) observed that RS3 derived from sago and rice starch could be well utilized as substrate by *Clostridium butyricum*, and revealed that good proportion of acetate: propionate: butyrate in that fermentation.

Apoptosis occurs normally during development and aging and as a homeostatic mechanism to maintain cell populations in tissues and the cell is an active participant in its own demise ("cellular suicide"). Apoptosis is a form of programmed cell death characterized by cytoplasmic condensation, plasma membrane blebbing and nuclear pycnosis, leading to nuclear DNA breakdown into multiples of ~200 bp oligonucleosomal size fragments (Chen and Ioannou 1996).

One of the most easily measured features of apoptotic cells is the break-up of the genomic DNA by cellular nucleases. These DNA fragments can be extracted from apoptotic cells and result
in the appearance of “DNA laddering” when the DNA is analyzed by agarose gel electrophoresis (Arends, et. al 1990). Principle of this assay is apoptotic DNA binds quickly to glass fiber fleece in the presence of a chaotropic salt, guanidine hydrochloride (guanidine HCl). After cellular impurities are washed off the fleece, the DNA is released from the fleece with a low salt buffer (Wyllie, et. al 1998).

B. OBJECTIVE

The objective of this research was to analyze apoptotic DNA fragments of HCT-116 human colon cancer cell incubated with cell free supernatant contained short chain fatty acids (SCFA) derived from fermentation of type 3 resistant starch (RS3) of sweet potato (Ipomoea batatas) by C. Butyricum BCC B2571 using DNA ladder assay.