CHAPTER I

INTRODUCTION

Lactic acid has been widely used in food, pharmaceutical, cosmetic and industrial applications and also used as a preservative agent and acidulant in foods, a precursor for the production of emulsifiers for baking industries, and as the pH controller in wine making [1,2]. Recently, new application of lactic acid is used as a monomer of Polylactic acid (PLA), which is a biodegradable polymer that has a high crystal polymer suitable for fiber and oriented film production. Lactic acid is also used as an intermediate in the synthesis of high-volume oxygenated chemicals. Therefore, by these widely applications make potentially and greatly expansion of lactic acid [3,4].

Lactic acid is an organic acid, produced by either chemical synthesis or microbial fermentation. It has two optical active stereoisomers, L (+) and D (-) forms [5]. The chemical synthesis of lactic acid has a racemic mixture of lactic acid, which is a major disadvantage. While, the microbial fermentation of lactic acid has the advantage in both utilization of renewable carbohydrates and production of optically pure L (+) or D (-) lactic acid depending on the strain selected [6]. Regarding to strain selection, it's evident that *lactobacillus salivarius subsp. salivarius* is known to be an L(+) lactic acid producer. Furthermore, it gave higher yield than other strains [7].

Carbon and nitrogen source also play the important role in lactic acid production by fermentation process not only the price but also production yield. In this study, we use cassava starch hydrolysate which is cheaper than glucose and brewer's yeast autolysate which is cheaper than yeast extract, as a carbon and nitrogen source, respectively.

Brewer's yeast autolysate is produced by autolysis of spent brewer's yeast. It has been shown that the brewer's yeast autolysate positively affects the rate of fermentation and activity of lactic acid bacteria, because it is a high source of nutrients and growth factors necessary for lactic acid bacteria [8]. Because of the increasing of a beer manufacturing, the amount of the spent brewer's yeast which is a waste material from beer manufacturing increasing trend. Although the spent brewer's yeast can using as an animal feed supplement, but the gain is not economically attractive [9]. Thereby, using the spent brewer's yeast for produce a brewer's yeast autolysate as a nitrogen source for

lactic acid fermentation is an interesting alternative. Therefore, this research will be emphasized on the brewer's yeast autolysate utilization for lactic acid production.

1.1 The objectives of this work

1. To determine the suitable conditions for lactic acid production from *L.salivarius subsp. salivarius* using yeast extract or brewer's yeast autolysate and glucose or cassava starch hydrolysate as nitrogen and carbon source, respectively, in batch fermentor.

2. To determine the effect of brewer's yeast autolysate utilization on lactic acid production using cassava starch hydrolysate.

1.2 The scope of this work

1. Study effects of various parameters on growth and lactic acid production as follows

1.1 pH (5.0, 5.5, 6.0 and uncontrolled pH) at glucose 20 g/l

1.2 Glucose concentration (30, 40, 50, 70, 80 and 100 g/l)

1.3 Cassava starch hydrolysate (CSH) concentration (70, 80 and 100 g/l)

1.4 Brewer's yeast autolysate (BYA) concentration (48, 95 and 190 ml/l, corresponding to yeast extract concentration of 5 g/l, 10 g/l and 20 g/l, respectively)

2. Compare the lactic acid production using D-glucose (commercial grade,CG) with the lactic acid production using cassava starch hydrolysate (CSH).

3. Compare the lactic acid production using yeast extract (YE) with the lactic acid production using brewer's yeast autolysate (BYA).

4. Study effects of the bitterness of brewer's yeast autolysate on the lactic acid production.

1.3 Expected benefits

1. To know the suitable media formulation and kinetic parameters for lactic acid production using brewer's yeast autolysate and cassava starch hydrolysate.
2. From kinetic parameter obtained, the continuous lactic acid fermentation is developed for enhancing lactic acid productivity.