CHAPTER I
INTRODUCTION

Owing to the exceeding changes in this world particularly rising gasoline prices, constant conflicts in the oil-supply region of the world and depletion of fossil fuels, many researches related with renewable fuels and chemicals such as ethanol and butanol have been substantially increased. Butanol, an alternative fuel, which is greater than ethanol, is used as an industrial solvent that can be produced from agriculture resources such as corn, wheat straw, stover, corn fiber, and other agricultural by-products. These agricultural products have been recognized as the important feedstock for production of fuels and chemicals. Corncobs are one of the potential Thailand's agricultural biomass feedstocks for renewable energy. Corncobs are dense and relatively uniforms, and they have a high heat value 18.3 to 18.8 MJ/kg (Kaliyan and Morey, 2010) with low N (0.01 %) and S (0.21 %) contents, and consist of 45 % cellulose, 35 % hemicellulose, and 15 % lignin (Sun and Cheng, 2002).

The production of biobutanol from lignocellulosic biomass has four major steps: pretreatment, hydrolysis, fermentation, and separation. Pretreatment step is required to remove lignin and hemicellulose, reduce cellulose crystallinity, and increase the porosity of the material (Sun and Cheng, 2002). Followed by enzymatic hydrolysis step which carried out by cellulase enzymes, the products of the hydrolysis are usually reducing sugars including glucose. After that, the hydrolysate from pretreatment and hydrolysis step were fermented through acetone-butanol-ethanol (ABE) fermentation using solventogenic clostridia. Finally, the solvent products will be separated.

Dilute acid pretreatment has been applied to a wide range of feedstocks, including softwood, hard wood, etc (Zheng *et al.*, 2009). The action mode of dilute acid is to solubilize hemicellulose, enhance enzyme accessibility in hydrolysis process, and lower degree of polymerization and crystallinity of the cellulose component. In a number of studies, it has been suggested that dilute sulfuric acid and phosphoric acid are advantageous in the pretreatment of cellulosic biomass as it hydrolyzate much of the hemicellulose (Gómez *et al.*, 2010). In addition, there are a number of approaches available to reduce inhibitory effects. Overliming step after pretreatment (hydrolysate) is a technique, which has been noted that yields and productivities in overlimed biomass are higher than or comparable to washing biomass with water (Qureshi *et al.*, 2010). Simultaneous saccharification and fermentation (SSF) was carried out for hydrolysis and fermentation step. The advantages of performing the enzymatic hydrolysis together with the fermentation, instead of in a separate step after the hydrolysis are the decrease of end-product inhibition in enzymatic hydrolysis, and the reduced investment costs. On the other hand, the favorable conditions such as temperature, pH, and time for the enzymatic hydrolysis and the fermentation were required to investigate.

The purpose of this work is to investigate the optimal condition of simultaneous saccharification and fermentation (SSF). In this work, the parameters are time, temperature, and pH by using Response Surface Methodology. In addition the effects of acid type and overliming step at the optimal conditions of pretreatment by dilute sulfuric acid and phosphoric acid from the previous researchers (Tangmanasakul, 2011 and Satimanont, 2012) on the reducing sugar yield were studied.