CHAPTER I
INTRODUCTION

Presently, energy is important for human life and its demands have been increasing exponentially. Fossil fuels are the main energy source and have been further decreasing; moreover: produced gases from fossil fuels combustion strongly affected environmental pollution. Therefore, it was necessary to investigate alternative energy. Many researchers are now interested in hydrogen and methane as a promising alternative energy. Hydrogen could be produced in various ways (Bica´kova´ and Straka, 2012) but the attractive way was biological process. They could be produced with less energy-intensive processes under mild condition and environmental friendly. Biological process for hydrogen production via dark fermentation under anaerobic condition was more favorable than photo fermentation because of the limitation of light intensity and ambient temperature and pressure operation (Kapdan and Kargi, 2006). In addition, the dark fermentation were more stable and higher hydrogen production rate than photo fermentation due to through day and night operation (Hallenbeck *et al.* 2002).

Hydrogen production can be produced from any raw material such as water (Zhang *et al.*, 2010), biomass (Chong et al., 2009), and fossil fuel (Shirasaki *et al.*, 2009). Therefore, the raw material was an important parameter for hydrogen production. Glycerol or glycerine is a main byproduct obtained from biodiesel production processes which is a good carbon source to convert anaerobically glycerine to hydrogen (Chonga *et al.*, 2009) and to methane (Fountoulakis and Manios, 2009).

In this work, hydrogen and methane production from biodiesel wastewater by adding glycerine 3.5% w/v to obtain constant feed chemical oxygen demand (COD) of 45,000 mg/l were investigated. Biodiesel wastewater which added glycerine 3.5 % w/v was studied using two-stage anaerobic sequencing batch reactor (ASBR) under mesophilic tempereature of 37 °C and a recycle ratio of 1:1. The pH was controlled at 5.5 under hydrogen ASBR unit and without control pH under methane ASBR unit. The two-stage ASBR system operated at different COD loading

rates in order to study the effect of organic loading rate on the hydrogen and methane production.