

UNIVERSITI TEKNOLOGI MARA

**METHANE PRODUCTION FROM
ANAEROBIC DIGESTION OF
POULTRY WASTE**

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ABSTRACT

Chicken consumption rate had increased year by year and subsequently producing huge number of poultry waste. Lack management of poultry waste will negatively affect the environment. Anaerobic digestion is one of the technologies that can be used to manage poultry waste while producing renewable energy. In this study, the physical, chemical and biological characteristics of poultry waste, POME and wastewater sludge was examined. To enhance the production of methane gas, the optimum condition during anaerobic digestion of poultry waste was investigated; pH, temperature, ratio of poultry waste and water, ratio of substrate and inoculum, hydraulic retention time, types of inoculum, and nitrogen purging. The anaerobic digestion was performed by using serum bottle and 5 L glassware as bioreactors. Methane production was measured daily by GC-FID. Results showed that the highest methane production was achieved at pH 7.0, mesophilic temperature (37 °C), 1: 2 ratio of poultry waste and water, 1: 2 ratio of substrate and inoculum, 30 days of hydraulic retention time, and using wastewater sludge as inoculum and without nitrogen purging with the value of 10.39×10^{-3} L, 14.99×10^{-3} L, 0.11×10^{-3} L, 0.68×10^{-3} L, 37.7×10^{-3} L, 9.79×10^{-3} L, and 5.48×10^{-3} L, respectively.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

Nowadays, due to the escalating increase of solid waste generation, sustainable environmental management has becoming an issue of global concern. The production of municipal solid waste keep rising up along with the steady increase in population, urbanization and industrializing (Chaya & Gheewala, 2007). Municipal solid waste can be classified into recyclable materials; (paper, glass, bottles), inert materials; (dirt, rocks, debris), hazardous waste; (paint, chemical, batteries), toxic waste; (pesticides, insecticides) and organic waste; (food waste, green waste) (Ansah et al., 2016).

Poultry waste is one of the example of organic waste. Poultry wastes include the poultry excreta/ manure, feathers, blood, broilers, and intestinal residues (Yoon et al., 2014). According to the Malaysia Poultry and Products Annual Report 2014, Malaysia is one of the highest per capita chicken consumption rates in the world. Chicken meat industry was forecasted to increase over the years along with the increase of population in Malaysia (Wahab & Rittgers, 2014). In 2012, 96 % of chicken broilers next to 3 % of ducks and 1 % of other poultry meat were consumed in Peninsular Malaysia (Abdurofi et al., 2017). Chicken broilers are highly demand as they are the most popular and cheapest source of protein among Malaysians. One of the factors that lead to the rising in demand for chicken broilers is it can be consumed by all religions unlike pork and beef which are restricted to minority of Hindu and majority of Malay Muslim population due to their religion restriction. Besides that, fast food restaurants such as Kentucky Fried Chicken, Nando's, Marry Brown, Mc Donalds and Kenny Rogers Roaster are growing fast in Malaysia and this has resulted in high demand for broiler and chicken eggs (Wahab & Rittgers, 2014).

As a result of the growth of population, the need to feed the hungry mouth increase and headed to the growing of poultry industry thus producing high amount of poultry waste as by-products (Salminen & Rintala, 2002). Large amount of by-