BISPHENOL A: DEGRADATION BY *Pseudomonas aeruginosa* ISOLATED FROM LOCAL WATER SOURCE IN MALAYSIA

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TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

Bisphenol A also known as 2,2'-bis (4 hydroxyphenyl)propane is a chemical compound that classified in the group of diphenylmethane and bisphenol which is has two hydrophenyl group. BPA is chemical compound that colourless and can dissolve in organic solvent but not soluble in water. It also has been using commercially since 1957 as the chemical that used in product that based on plastics and as the epoxy resins. Polycarbonate plastics is the most product that easily BPA can be found. It usually use in the production of container that used to store food and in the manufacturing of plastic bottle. Epoxy resins usually use to coat the inside of metal product such as cans and bottle caps. Bisphenol has many types such as bisphenol AB, bisphenol AF, bisphenol B and bisphenol TMC.

In 1981, A.P Dianin is the person who able to synthesize the BPA and discover BPA as the potential commercial chemical in the 1930s during it research to discover synthetic estrogen (Doods & Lawson, 1936). In the classical estrogenicity assay of vaginal cornification is found that other synthetic compound which known as diethylstilestrol (DES) is more far potent than BPA, thus BPA was abandoned as the synthetic estrogen in late 1940s to 1971 which use to prevent pregnancy problems such as miscarriage and premature birth (McLAchlan, 1936).

In the chemical reaction, BPA can be produce by the condensation of phenol and acetone. Hydrochloric acid or styrene DVB catalysts need to be presence in order to complete the condensation process. The molar ratio of the phenol and acetone need to be at 3:1 to 10:1 and reaction is acid catalysis reactions which need to be at 60-80°C (Sheemol, Unni, & Goppinathan, 2001).

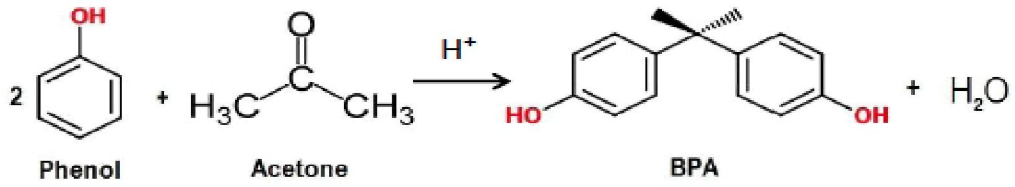

Figure 1.1: The chemical reaction of BPA formation (Farooq, April 2015).

In the industry, BPA is easily discharged into terrestrial aquatic and marine environments from its manufacturing or treatment facilities which will disturb the endocrine system of aquatic life and humans. There are several methods on how to remove from the environment polluted with BPA but the most suitable method of removing BPA is by the microbial degradation. Microbe plays the most important role in the BPA removal from the environments that had been polluted with BPA (Dorn, Chou, & Gentempo, 1987). There are several bacteria, fungi, and planktons which are capable in degrading BPA.

1.2 PROBLEM STATEMENT

There are not many people that know that Bisphenol A (BPA) which contain in the plastics product can bring harmful to the endocrine system not only to human but to other organism especially to the aquatic organism. There are 4 ways how BPA can be harmful to human and release into environment which is through the water source, air, and soil and plastics product. In the studies of McKay level 1 modelling which about the distribution of BPA contaminant in different environment was found that about 25% BPA can be found in the soil while 25% in sediment and about 50% can be found in the water source which means BPA mostly contaminate in the water source (Staples, Dorn, Klecka, Branson, O'Block, & Harris, 1998). The solubility of BPA in water is in the range of 120 to 300 µg/mL (Yamada, Urase, Matsuo, & Suzuki, 1999).

There are several methods how BPA can be removed from environment but so far the best method was through the degradation by bacteria. There are a lot of bacteria species which capable in degrade BPA in local water source but so far the best bacteria can degrade BPA is *Pseudomonas* species. The research on *Pseudomonas* species which capable in degrade BPA mostly had been done in western country which is the *Pseudomonas* species maybe is not same with Malaysia bacteria because of the condition of the environment which plays the important role in the growth of the species. Thus, this research purpose is to find the local