CHAPTER I
INTRODUCTION

1.1 Background

Curcumin that contains in turmeric roots which gives the major yellow pigment is known as a great potential source of antioxidants and has been used as a spice and coloring agent. Curcumin is known to protect biomembranes against peroxidative damage. Most of the antioxidants have either a phenolic functional group or a β-diketone group. However, curcumin is a unique antioxidant which has a several type of functional groups such as the β-diketo group, carbon-carbon double bonds, and phenyl rings that contain varying amounts of hydroxyl and methoxy substituents (Aggrawal, 2007).

Lately, researchers have found that modification of curcumin into 3,4-dihydropyrimidine are able to improve the antioxidant properties of curcumin (Lozada *et al*., 2017). Biginelli reaction is used in modification of curcumin by substituted aldehydes in this experiment and known as Biginelli condensation. The term Biginelli condensation is a reaction between a β-keto ester, an aryl aldehyde and urea to produce pyrimidines under acidic conditions. The aldehyde component is the most commonly explored regarding its structural variation which might give various modified form. In this research, the modification of curcumin with two different aldehydes which are cinnamaldehyde and benzaldehyde and three different modifiers which are urea, thiourea and guanidine will be observe and is expected that through Biginelli reaction curcumin will undergo structure modification which might improve the antioxidant activity (Brachmachari, 2015).

1.2 Research Problem

Modification of curcumin can improve the antioxidant activity of curcumin since by modified the curcumin, it would have longer and various structure with the new formed structure was expected to improve the antioxidant activity. The conversion of curcumin as semicarbazone and pyrazole derivatives were known to improve antioxidant activity of curcumin, therefore the conversion of curcumin to dihydropyrimidine was expected to have a potential in increasing the antioxidant activity. However, modification of curcumin with solvent could lead to environmental damage, therefore using solvent-free modification was tried to minimize the damage and to create a modification with a better yield, easier and faster (Ghasemzadeh, *et al.,* 2013). The modification of curcumin performed with the different of aldehyde, modifier and catalyst used in the reaction. Different aldehyde and modifier would affect the form and activity of the crude curcumin analog, in this research benzaldehyde and cinnamaldehyde would be used as the aldehyde and urea, thiourea and guanidine as the modifier. While for the catalyst, the proper amount of catalyst used was important since it would affect the rate of the reaction.

1.3 Objectives

1.3.1 General Objectives

The general objective of this research was to study the antioxidant activities of crude curcumin analog.

1.3.2 Specific Objectives

The specific objectives of this research were:

1. To determine effect of solvent and catalyst amount on the yield of crude curcumin analog and to apply the selected amount of catalyst in the presence or absence of solvent to the crude curcumin analog with different types of aldehyde and modifier.
2. To determine the effect of different types of aldehyde and modifier on the antioxidant activity of the crude curcumin analog and compare with the commercial curcumin.
3. To measure the wavelength and mass spectrum of the crude curcumin analog that had the best antioxidant activity.