

CHAPTER I

INTRODUCTION

1.1 Background

Clove is a well-known spice that contain eugenol as the major component. Clove oil is usually obtained by hydrodistillation, steam distillation, or solvent extraction method. Clove oil contained eugenol, caryophyllene, and eugenol acetate as three main active components. The major component in clove oil is eugenol. There is 80-95% of eugenol contain in clove oil. While the minor including methyl salicylate, chavicol, α -copaene, α -amorphene and caryophyllene oxide (Amelia *et al.*, 2017). Eugenol and other volatile components are contributed to the aroma of clove oil. Eugenol is a potent phenolic compound that contain free radical scavenging activity. The scavenging effect found in eugenol is due to the presence of alcohol group in its structure.

Eugenol has numerous beneficial including antimicrobial, anaesthetic activity, anti-inflammatory, anti-diabetic potential, anti-carcinogenic effect, neuroprotective ability, and hypolipidemic efficiency. Therefore, it is used in pharmaceutical, food flavouring agent, fragrance, and cosmetic industry (Amelia *et al.*, 2016). However, the usage of this eugenol-rich fraction of clove as a in food industry is limited, owing to its strong and pungent odour also toxicity can caused irritation. According to Robin (1999) studies show that eugenol odour gives unpleasant responses. Eugenol has also potent oxidative activity that is volatile or easily oxidized which limits their practical use. Therefore, in order to overcome the

pungent odour and the potent oxidative activity, derivatives of eugenol can be produced. According to Laroque *et al.*, (2015) acetylation of eugenol can produce eugenol derivative by substituting the hydroxyl group (-OH). This reaction produced inactivated or occupied eugenol's molecule that could not have typical clove spice odour (Arctander, 1996).

Eugenol derivative that have potential with lower aroma and lower toxicity is acetylated eugenol (4-Allyl-2-methoxy-phenyl acetate). Acetylated eugenol is one of the eugenol derivatives that used widely in food flavouring industry. The addition of acetyl group to eugenol known as acetylation reaction. It has substituted the hydroxyl group in eugenol that has radical scavenging activity. The presence of phenolic group with partial negative charge (δ^-) able to react with carbonyl atom that has partial positive charge (δ^+) from acetic anhydride (Orita *et al.*, 1997).

In recent years shown that several synthesis of acetylated eugenol from eugenol acetylation using acetic anhydride with several type of catalyst such as Novozyme 435, pyridine, metal triflates, and metal salts. Although the majority of these method ensure good results, there is still need for simple, mild, less toxic, and easy-to-handle catalyst to generate acetylated eugenol. Some of the reported methods for acetylation of eugenol suffer disadvantage such as cost, toxic, corrosive and difficult to be removed after reaction. In order given those drawbacks, new, efficient, and eco-friendly methods are still in demand to produce acetylated eugenol. In this research sodium hydrogen carbonate has been used as the simpler catalyst that can mediate acetylation of eugenol (Lugemwa *et al.*, 2013).

1.2 Research Problem

Clove oil is extensively used in fragrance and flavour formulation for its spicy aroma. However, the uses of cloves in food has become limited due to the spices cloves odour is recognize as strong and unpleasant odour for majority. Several studies also show that eugenol has cytotoxicity effect on human and causing irritation. Therefore, in this experiment derivative eugenol is produced using acetylation with the help of environmentally and economically acceptable catalyst which is sodium hydrogen carbonate a metal carbonates as mild base. Acetylation reaction with using sodium hydrogen carbonate is reaction that can produce corresponding esters in good to excellent yield, lower toxicity, and lowering the pungent aroma of eugenol.

1.3 Objectives

1.3.1 General Objectives

The general objective of this research is to conduct acetylation of eugenol and study the succeed of the reaction based on radical scavenging activity of the derivative compound.

1.3.2 Specific Objectives

The specific objectives of this research are:

1. To determine best condition of acetylation to produce eugenol derivative from different concentration of acetic anhydride and reaction time in term of yield and TLC.

2. To compare the eugenol derivative from different concentration of acetic anhydride and reaction time in terms of the yield, UV-Vis, and radical scavenging activity.
3. To compare the characters of pure clove oil and eugenol derivative in terms of the radical scavenging activity, toxicity, scoring test, UV-Vis, FT-IR, and GC-MS.

