CHAPTER 1

INTRODUCTION

Hypertension is defined as high blood pressure (Hock et al., 1995). It is known as a worldwide problem as 15-20% of all adults are affected by this condition (Wang et al., 2008). Being one of the major risk factors for coronary heart disease, hypertension also contribute in the development of cardiac hypertrophy with heart failure, aortic distension and renal failure, neurologic effects and development of cerebro- and cardiovascular disorder with unknown mechanisms (Yoshii et al., 2001; Sharifi et al., 2004; Escobales et al., 2005). It is also known as a high risk factor for brain ischemia, stroke, arteriosclerosis, end-stage renal disease and myocardial infarction (Wang et al., 2008, Sabbatini et al., 2000). The blood pressure and the risk of cardiovascular disease (CVD) is continuously consistent with each increment of 20/10 mmHg double the risk of CVD (Erdogan et al., 2010).

Various drugs has been used to control blood pressure such as beta blockers, calcium channel blockers, angiotensin converting enzyme inhibitors (ACEI), and angiotensin receptor blockers (Podymow et al., 2011). These drugs are used individually or with combination to optimize the mechanism of action in reducing the high blood pressure. However, the unwanted side effects of these drugs cannot be disputed even though it is proven to reduce blood pressure effectively. Therefore, the studies of active compound from natural resources that are potentially reduces high blood pressure are important and its medicinal properties have been great interest among researcher.

Antioxidant is a substance known to have the ability to stop radical chain reactions by scavenging reactive nitrogen species (RNS) and reactive oxygen species (ROS) or by inhibited the free radical before it is going to be formed (Wootton-Beard. et al., 2011). Free radicals is a highly reactive molecule that contain unpaired electrons that cause oxidative stress as well as damage to the protein, lipids, carbohydrates, enzyme and DNA in cells and in tissues. These will contribute to the development of cardiovascular diseases, diabetes, autoimmune disorders, neurodegenerative diseases and cancer via DNA fragmentation, lipid peroxidation and membrane damage (Ratnam et al., 2006). The oxidative stress that were suggested to play a crucial role in the pathogenesis of various disorders and diseases has attracted attention from the researchers and general public to the important of the role of antioxidant in the prevention and treatment of these disease as well as in the maintenance of human health (Niki E.,2010). Some antioxidant known to act as potent free radical scavengers while others possess strong metal chelating effects, thus this make differences in mechanisms and effectiveness against different substrate (Wootton-Beard. et al., 2011). Nutraceutical and cosmetic interest also give their attention to the natural antioxidant contain in foods, fruits, beverages, spices and supplement, while pharmaceutical industry were focused more on various synthetic antioxidant and their preparations (Niki, 2010).

Numerous studies using different method were developed to assess and evaluate antioxidant capacity and efficacy. However, the correlation between determinations of activities on the same materials using different assays and between activities that were determined by the same assay but in different laboratories were facing an issues. Oxidative stress in human body involved various active species, reaction characteristic and different mechanisms thus universal method to evaluate

antioxidant activities accurately and quantitatively were hard to be determined (Niki, 2010).

Two-thirds of the world's plant species were suggested by some researchers, to have medicinal value (Krishnaiah et al., 2011). Therefore, plants are always be a basic source of drugs in drug development and a basis in traditional medicines (Tirapelli et al., 2010, Krishnaiah et al., 2011). Medicinal plants provide a rich source of biologically active compounds, however only small percentage has been investigated for its phytochemical properties (Tirapelli et al., 2010). Natural products derived from medicinal plants have been studied for its therapeutic agents in treating chronic disease such as cardiovascular disease, cancer, hypertension, diabetic and other oxidative stress related disease. Attention recently has focused on the natural compound in treating hypertension as well as hypertensive related disease (Tirapelli et al., 2010). The existence of natural compound such as phenolic compound, diterpenoid, and anthocyanins were known to have effect on cardiovascular and antihypertensive action (Tirapelli et al., 2010). There were 80% of peoples around the world rely on traditional medicine that based on natural products for their primary health care needs (Krishnaiah et al., 2011). As in Malaysia, several of medicinal plants possess antioxidant properties have been used as daily supplement to reduce high blood pressure. In this study the antihypertensive properties and antioxidant activity of *Tacca integrifolia* was investigated.

Tacca integrifolia Ker-Gawl from family of Taccaceae is a herbaceous plant distributed in Southeast Asia (Razak et al., 2007). It is also known as *Tacca cristata* or by its local name as 'Belimbing Tanah'. *Tacca integrifolia* was easily found in the understory of rain forests in a deep shade, with a diversity of soil types and a good air circulation. It has long leaves with a short stemmed while Asian *Tacca* has an attractive and entire leaves with vertical growth habit. Its filiform can be extent to 1 foot in length

and was hang below the flowers thus make it looks like whiskers. Its white bracts are drift over the white flowers and are beautifully veined with purple colour. Some of Asian people planted *Tacca integrifolia* in their garden as ornamental plant without knowing its medicinal value, while others consumed it as traditional medicine in order to maintain normal blood pressure, to reduce high blood pressure as well as to control diabetes. *Tacca* species have been used for the treatment of gastric ulcer, enteritis, and hepatitis in China while its rhizomes were used for improving sexual function and controlling blood pressure in Thai herbal medicine (Kitjaroennirut et al., 2005). The root broths of the plant were used for treatment of hypertension, and hemorrhoids. Woman in confinement used it as a bath to remove wind in the body while the saps from the leaves used to treat skin disease. In other application, extracts from the tuber and roots is mixed with *Goniothalamus malayanus* (Mempisang) for treatment of the kidney. Even though they are useful in the treatment of hypertension and other diseases, the scientific data on its therapeutic properties has not yet been documented.

It's unknown medicinal properties and lack of scientific documentation has triggered the interest of researchers to study and investigate its therapeutic properties as well as its toxicity. The aim of this study is to isolate and characterize the anti-hypertension and antioxidant properties from *Tacca integrifolia*. The determination of the ACE inhibitor will provide a fundamental knowledge in its mechanism of action in treatment of cardiovascular disease and other oxidative stress related disease. The finding of this research will contribute in the development of pharmacological industry offering an alternative treatment to hypertension and hypertension related disease. It is also to ensure its effectiveness with minimal critical condition of cardiovascular disease in hypertensive patient without unwanted side effects. Therefore, research on the isolation and characterization of Angiotensin Converting Enzyme (ACE) in *Tacca*

integrifolia are important for treatment of hypertension and hypertension related diseases.