

**UNIVERSITI TEKNOLOGI MARA**

**PHYTOCHEMICAL, BIOACTIVITY  
AND CHEMOTAXONOMY STUDIES  
OF *Dipterocarpus verrucosus*  
Foxw. ex Sloot, *Dipterocarpus cornutus*  
Dyer AND *Dipterocarpus crinitus* Dyer**

**WAN ZURAIDA BINTI WAN MOHD ZAIN**

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## ABSTRACT

*Dipterocarpus* or commonly known as 'keruing' is an important source of dammarane, which contributes to a highly valued economic plant in Southeast Asia. Preliminary study revealed that this plant is rich in phenolic compounds and potential antioxidants. Thus, the stem bark of three *Dipterocarpus* species (*D. verrucosus*, *D. cornutus* and *D. crinitus*) are subjected to extensive chemical and biological studies. The sample was collected from UiTM Pahang Forest Reserve and was extracted in methanol and acetone via cold extraction method. Isolation was done using multiple techniques of chromatography and the structural elucidation of the compounds were characterized using spectroscopic techniques as well as comparison with literature. Phytochemical investigations successfully afforded 21 compounds with one compounds proposed as a new: 4'-*O*-methylepigallocatechin-3-*O*-(3''-*O*-methyl)gallate, two flavonoid: 4'-*O*-methylgallocatechin and 4'-*O*-methylepigallocatechin, fourteen oligomer resveratrol: (+)ampelopsin F, ampelopsin E, davidiol A, stenophyllol B, resveratrol, isohopeaphenol, (-)- $\epsilon$ -viniferin, (-)-ampelopsin A, laevifonol, (-)- $\alpha$ -viniferin, vaticanol B, hopeaphenol, hemslyenol D and diptoindonesin E, two terpene:  $\beta$ -sitosterol and  $\beta$ -sitosterol-glucoside and two coumarin: bergenin and scopoletin. Seventeen phytochemicals of sufficient quantities including three crude extracts were further tested for their antifungal activity. The activity comprising on Minimum Inhibitory Concentrations (MIC), Minimum Fungicidal Concentration (MFC) and germination assay against pathogenic strains namely *Aspergillus flavus*, *A. oligosporus*, *Rhizophus oryzae* and *Fusarium oxysporum* and *F. oxysporum* was found as the most sensitive. Resveratrol,  $\epsilon$ -viniferin, ampelopsin F, catechin, bergenin, and  $\beta$ -sitosterol glucoside at 0.1% inhibited more than 50% and were higher than the amphotericin B. MICs of *D. verrucosus*, *D. cornutus* and  $\epsilon$ -viniferin against *F. oxysporum* were 3.8  $\mu\text{g/mL}$  and were lower in comparison with amphotericin B (4  $\mu\text{g/mL}$ ). Germination assay revealed all samples possessed complete sterility (0%) at concentration 1, 2 and 4 $\times$ MIC except for catechin, scopoletin, bergenin,  $\alpha$ -viniferin, davidiol A and diptoindonesin E. Due to insufficient quantities, fourteen compounds were tested with 1,1-Diphenyl-2-picrylhydrazyl (DPPH) methods, while Total Phenolic Content (TPC), Ferric Thiocyanate (FTC) and Thiobarbituric Acid (TBA) were evaluated on three compounds only. Screening on antioxidant indicated all extract showed highest percent inhibition in all methods used FTC and TBA, DPPH while resveratrol, diptoindonesin E, catechin, ampelopsin A and scopoletin possessed IC<sub>50</sub> between 100-1000  $\mu\text{g/mL}$ . Structure analysis relationship revealed the presence of double bond of olefinic unit contributed to give high activity of both activities. Chemotaxonomy significance suggested close relationship between *Dipterocarpus* and *Vatica* which is classified under Dipterocarpeae tribe.

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# CHAPTER ONE

## INTRODUCTION

### 1.1 Overview

Malaysia has a great diversity of ecosystems. Most studies on the terrestrial ecosystems in Malaysia had been focused on the forests, as Malaysia was covered almost completely by forest about 100 years ago and also because timber from the forests were important economically. Species of plants, animals and micro-organisms are the basis of most traditional medicines. Rural communities in developing countries still depend on traditional medicines for their healthcare needs. Modern medicine uses plants and plant products as the basis for about a quarter of all their commercial drugs. Pharmaceutical companies and research institutes see the rich biodiversity, especially of the tropics as a source of new drugs and carry out systematic collection of samples for chemical analysis and testing. This form of systematic search for useful compounds from plants is known as “biological prospecting”. Biodiversity is being prospected for their use in new and old disease (Multilateral Environmental Agreement 2006). The tropical rain forests of Malaysia constitute the core of biodiversity in Malaysia. The forests are a unique natural heritage which has evolved over 130 million years, resulting in a very rich flora and fauna. Malaysia’s forests had been and continue to be of great economic importance for its development. Timber from the forests had been a major income earner in Malaysia in the 1960s till the 1990s and played a critical role in Malaysia’s economic development. Besides timber, there are also other non-timber forest products, such as gaharu, gums and resins which are collected and traded but they are economically of much lower value compared with timber (Multilateral Environmental Agreement, 2006).

Thus, the selection of plants is a first research step based on certain criteria such as ethnobotanical and ethno pharmacological approaches, including information about the traditional use of plants to treat specific diseases. Also, many studies explore chemotaxonomic approach, which relay on the study of plants from the same family or genus of a species from which active compounds have been already isolated (Gupta, 2016). Thousands of years ago, Malaysia had an extensive variety of plant species and traditional medical systems. More than 1300 medicinal plant species have been