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Chemical Prospecting of Malaysian Dipterocarpaceae from HSUiTM, Pahang, Malaysia

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Abstract: A great majority of the Malaysian population relies on indigenous medicinal plants for treatment of diseases. The search for the plant constituents with potential activity for medicinal purpose can be performed successfully by chemical methods and, in combination with biological evaluation. However, pre selection of plants to be investigated is also one of the most important prerequisite. In HSUiTM, there are many plants that have not been evaluated for their potential medicinal value. This paper presents a brief review on resveratrol in dipterocarpaceae plants and their health benefits also presented.

Key words: Natural product · Dipterocarpaceae · Resveratrol · Health benefits

INTRODUCTION

According to World health organization (WHO) reports more than three quarters of the world population relies upon traditional remedies for their health care. In fact, plants are the oldest friend of mankind. They not only provided food and shelter but also served the humanity to cure different ailments [1]. Malaysia is blessed with one of the oldest and richest flora in world. Malaysians have a long tradition of benefiting from this rich and beautiful flora through our traditional medicine practices. However, until today, only a few species of the well-known plants have been studied for their chemical constituents and biological activities. UiTM Pahang Forest reserve (HSUITM).

UiTM Forest Reserve Jengka is about 180 km North of Kuala Lumpur in the district of Maran, Pahang. The forest covers an area of about 100 hectares and is classified as secondary forest [2]. This land was contributed by Pahang States's Government in 1985 for learning objective on wood and agriculture course. This forest is a part of Jengka reserve forest when long time ago has a function as economy source for local community especially to Orang Asli's society. The vegetation of this forest is classified as forest herbs, shrub and tree. Several researches on UiTM Forest Reserve Jengka have been done such as aspect of management forest [3] and natural product resources [4]. However there is no biological study on this potential forest.

Dipterocarpaceae is a large family of tropical plants, consists of 16 genus which are *Anisoptera*, *Balanocarpus*, *Cotylelobium*, *Dipterocarpus, Doona*, *Drybalanops, Hopea, Isoptera, Neobalanocarpus, Parashorea, Shorea, Stemonoporus, Upuna, Vateria* and *Vatica* and it has approximately 600 species. Three main genuses are *Shorea* which have 150 species, *Hopea* with 100 species and *Dipterocarpus* around 75 species. In Malaysia they are known as *Meranti, Merawan and Keruing*. For local communities they used this plant for construction materials and lately it has been used in the plywood industry. *Dipterocarpus* trees produces *'minyak keruing'* which is used locally for caulking boats and for torchs, medicinal and other minor purposes. Meanwhile, *Shorea* and *Hopea* produces resin for varnishes. Research on chemical constituents in

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Dipterocarpaceae trees has been ongoing for many years. This famili of tree plant produces a wide variety of natural products, including among other terpenoids, flavonoids, arylpropanoids and oligomer resveratrol. Research on the chemical constituent has been focus on the resinous part which is terpenoid in nature and also on sesquiterpenes. Since hopeaphenol and polyphenol compound from oligomer resveratrol has been isolated from two species of *Hopea odorata* and *Balanocarpus heimee* in early 1950,0 research on resveratrol has been ongoing aggressively. This was supported by many of the latter class of compounds, which form the major polyphenolic constituents showing a variety of biological activities [5].

MATERIALS AND METHODS

Plant Material: There are 19 species of Dipterocarpacaeae in UiTM Pahang forest reserve (HSUITM Pahang) as reported by [2]. The list of dipterocarpacaeace species are shown in Table 1.

Plant can be choosen either randomly, based on the literature or following consultation with local healers. After choosing the right material, plant collection must be botanical identified and voucher specimen must be placed in the local herbarium. All the data about the collection must be observed and documented, such as climate conditions, seasons, geographical localization, environmental conditions, etc. In order to elucidate future differences in bioactivity compared with other results found. Any plant part can be used but consultation of the literature or with local healers is very useful to reduce research time.

Table 1: Dipterocarpacaeace species in HSUiTM Pahang

Vernacular name	Scientific name
Balau Kumus hitam	*Shorea maxwelliana*
Damar hitam	*Shorea multiflora*
Damar siput	*Shorea faguetiana*
Kapur	*Dryobalanop aromatica*
Keruing gombang	*Dipterocarpus cornutus*
Keruing mempelas	*Dipterocarpus crinitus*
Keruin ropol	*Dipterocarpus hasseltii*
Keruing merah	*Diterocarpus verrucosus*
Keruing neram	*Dipterocarpus oblingofolius*
Meranti Kepong	*Shorea ovalis*
Meranti sarang punai	*Shorea parvifolia*
Meranti melantai	*Shorea macroptera*
Meranti pa'ang	*Shorea bracteolate*
Meranti tembaga	*Shorea leprosula*
Meranti nemesu	*Shorea pauciflora*
Meranti belang	*Shorea resinosa*
Meranti rambai daun	*Shorea acuminate*
Resak keluang	*Vatica bella*
Resak laru	*Vatica pauciflora*

RESULTS AND DISCUSSION

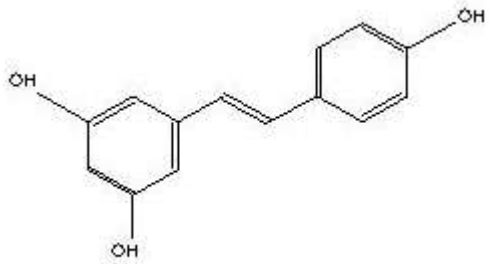
Extraction and Isolation: Oligomer resveratrol compound are usually isolated from the bark or the stem of the plant, except from one source that reported the isolation of the compound from the leaf [6]. In general, most of the resveratrol are semipolar and polar, so that, the extraction of the sample tested require the semipolar and polar solvents like acetone, chloroform, methanol etc. Usually, the samples are soaked in semipolar solvent at room temperature for one until six days. Extraction process in the same solvent was repeated in duplicate to ensure that all of the semipolar compounds are extracted. Then, the sample was soaked again in polar solvents like ethanol or methanol to extract the more polar compounds.

Crude extract are then partition with ether or ethyl acetate [7] and will be purified with chromatography techniques. Sometimes, the purification involves the crystalization process to produce pure oligomer resveratrol. Lastly for structural eluicidation, the chemist will used a variety of instrumentation such as Neutron Magnetic Resonance (NMR) spectroscopy to know the Carbon (C) and Hydrogen (H) position in the molecule and, Infra Red (IR) spectroscopy to know functional group of the compound, Mass spectroscopy is carried out to show molecular and fragmentation ions that revealed the amount of oligoresveratrol unit, while X-ray diffraction to revealed the absolute molecule structure and many more.

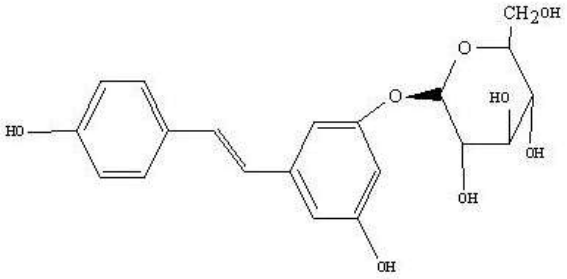
Resveratrol: Resveratrol was first isolated in 1940 as a constituents of the roots of white hellebore (*Veratrum grandiflora O. leos*) but has been found in various plant including grapes (*Vitis vinifera*), *Vaccinum spp* such as blueberry, bilberry and cranberry, peanuts (*Arachis hypogaea*) [8] also in woody plant like Dipterocarpacaeae (Sootheswaran and Pasupathy 1993). The first resveratrol from Dipterocarapaceae is isolated early 1950 from *Hopea odorata* (meranti siput jantan) and *Balanocarpus heimeii* (Cengal). Resveratrol is naturally found in plants to protect them from disease, injury or fungal infection and it is called 'phytoalexins' (Sotheeswaran and Pasupathy 1993). 'Phyto' means plant in Greek, while 'alexin' means to 'ward off' or to protect.

Chemistry of Resveratrol: The basic unit (monomer) of resveratrol is trans-3,5,4'-trihydroxystilbene. The resveratrol units are joined together by phenolic oxidative coupling reactions at several different active sites resulted in the formation of complicated oligoresveratrol (dimer, trimer, tetramer, heksamer and octamer) to formed a resveratrol derivatives [5].

A. Monomer resveratrol

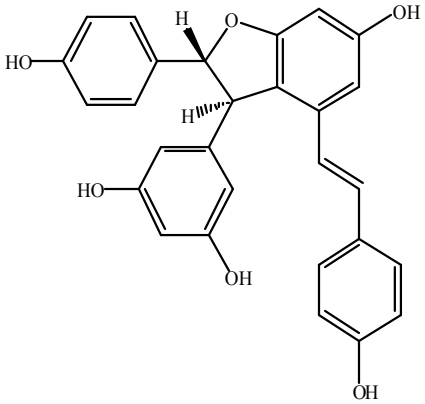


Resveratrol

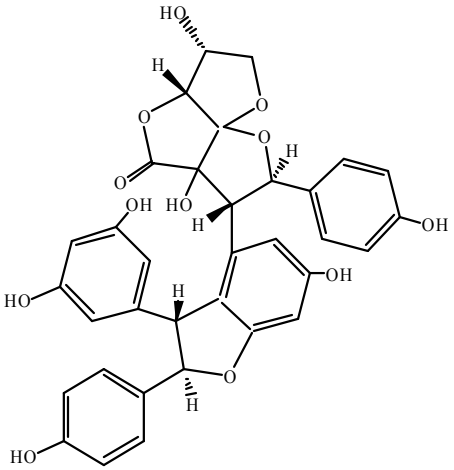


Resveratrol C-glukosida

B. Dimer resveratrol

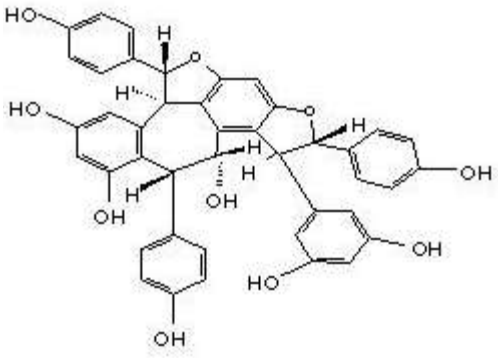


e-viniferin

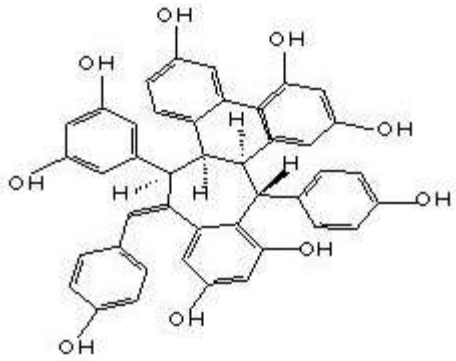


Laevifonol

C. Trimer resveratrol

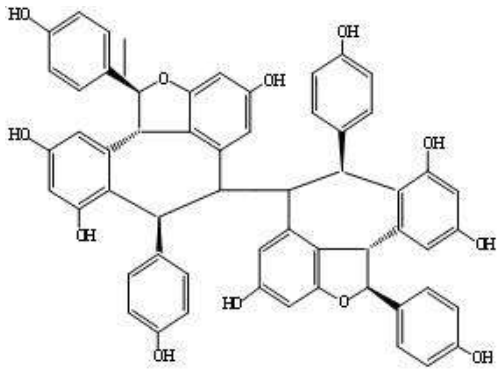


Hemsleyanol B

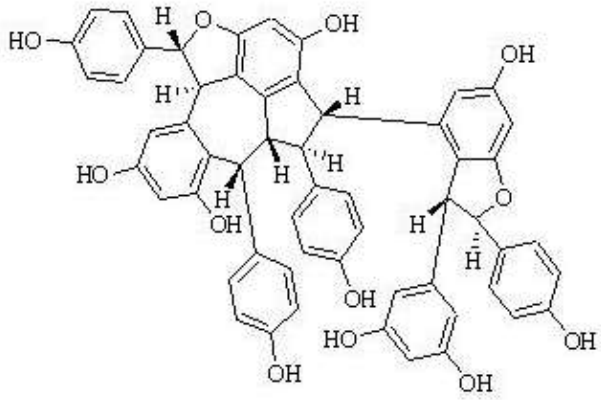


Stemonoporal A

D. Tetramer resveratrol



Vaticanol B



Hopeafenol

Health Benefits of resveratrol

Cardiovascular Benefits: Studies have shown resveratrol inhibit blood clots [9], which are known to contribute to heart attack strokes. Resveratrol also has been shown to enhance the production of nitric oxide which is a chemical that help to keep arteries relaxed, allowing for improve blood flow [10, 11].

Oxidative Stress: Resveratrol has been shown to act as an anti oxidant [12]. It scavenges free radials. Studies had shown resveratrol improve diabetic neuropathy. Diabetic neuropathy is one of the most common complication affect diabetics.

Neurodesenarative Disorders: Evidence has shown that resveratrol may be beneficial against nerve degeneration in disease such as Huntington's, Parkinson's, Alzheimer's and stroke [13].

Cancer: Resveratrol has been found to increase the expression and activity of enzyme that help rid the body of potentially toxic carcinogenic compounds [14]. It also been shown to help in the fight against cancer cell that rapidly grow, by stopping them [8]. Furthermore, cancer cell in the body can also develop their own blood supply, which help them to survive but resveratrol has been shown to stop this process [15]. A number of human studies are currently underway to evaluate the rule of resveratrol in cancer prevention [16]. Resveratrol (*trans*-3,4',5-trihydroxystilbene), a phytoalexin present in grapes, has been reported to possess chemopreventive and chemotherapeutic activities. In the present study examined the growth-inhibitory effects of resveratrol in human ovarian cancer PA-1 cells, considering eEF1A2 as a potential molecular target [17].

Inflammation: New research showing resveratrol potential to defeat many chronic diseases such as inflammation. The inflammation will contribute to chronic disease for example cardiovascular disease and cancer through various mechanism.

Weight Control, Exercise Endurance, Anti-Aging: Resveratrol had shown can effective in kept the weight down. In middle-aged mice eating high calorie, fattening diets, resveratrol promoted a longer life span and showed increased survival similar to that of calorie restriction. The mice fed resveratrol kept their weight down compared to the control mice and had doubled the running endurance [18].

CONCLUSION

Natural product research and development has been an ongoing academic activity in Malaysia for many decades. Until recent times, the level that we have been successful was measured by the number of papers published. However, until today, very few species of the well known plants have been studied for their chemical constituents and biological activities. This is because we do not have sufficient knowledge and experience coupled with the lack of coordination among scientists. In addition, in preparing ourselves to survive in the globalization climate, we need to establish networks and strong collaborations among scientist, industrialist and institutions within the country and also amongst nations. Such activities and linkages will help our country to realize its vision to fortify the neutraceutical and pharmaceutical industries in Malaysia. We hope this report will be used as platform to generate new ideas and collaborations and also to strengthen the existing ones.

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