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**ANTIOXIDANT ACTIVITIES, TOTAL PHENOLIC AND FLAVANOID
CONTENT IN SELECTED SARAWAK RICE VARIETIES USING
AQUEOUS-BASED EXTRACTION TECHNIQUE**

By

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DECLARATION

I, hereby declare that this thesis is my original work and has not been submitted previously or currently for any other degree at UiTM or any other institutions.



(Muhammad Faisal Ikhwan B. Othman)

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ABSTRACT

Plant-derived metabolites compounds known as phytochemicals which comes from foods such as cereals, beans, botanicals and beverages made from plants such as tea and wine are considered to play a major role in protecting human against diseases. Certain rice varieties contain concentrated pigment such as anthocyanidin or proanthocyanidin in the rice bran layer which contributed to different colors of rice and reported with high antioxidant activity depending on the content of phenolic compounds. In Sarawak, there are over 100 indigenous rice varieties with different colors that were produced by the locals with different colors but less scientific attention has been carried out on its health potential. This study aimed to determine the antioxidant activities, total phenolic content and total flavonoid content of selected Sarawak rice varieties using aqueous-based extraction technique. The rice samples were extracted using distilled water at 60 – 60°C for 6 hours and the rice extracts were analyzed for their antioxidant activity using DPPH radical scavenging and ferric reducing antioxidant potential (FRAP) assays as well as their total phenolic and total flavonoid content. In this study, CU demonstrated the highest scavenging activity (47.37 ± 1.09), followed by BP (22.62 ± 2.41), BR (11.90 ± 0.11), MU (10.92 ± 0.50), WK (10.08 ± 0.75) and BM (4.68 ± 0.38). BR demonstrated the highest ferric reducing antioxidant potential (0.27 ± 0.02), followed by WK (0.17 ± 0.01), MU (0.16 ± 0.01), BM (0.11 ± 0.02), CU (0.11 ± 0.04) and BP (0.05 ± 0.01). The results obtained for both total phenolic and flavonoid content were similar in the following order WK>MU>CU>BM>BP with BR exhibiting the highest total phenolic and flavonoid content (188.33 ± 6.76 and 229.33 ± 16.59 respectively). Pearson's correlation analysis demonstrated that DPPH was weakly correlated with both total phenolic as well as total flavonoid content ($r = 0.287$ and 0.317 , respectively, $P < 0.01$) whereas significant correlation was seen between FRAP and both total phenolic and flavonoid content ($r = 0.932$ and 0.966 , respectively, $P < 0.01$). CU and BR rice exhibited significantly higher antioxidant activities and contained higher polyphenolic contents compared to other rice samples used in the study. Significant ferric reducing antioxidant potential activity of BR rice was largely contributed by the total phenolic and total flavonoid contained in the rice. BP rice showed the lowest value for FRAP, total phenolic and total flavonoid contents whereas BM rice showed the lowest value for DPPH assay.

CHAPTER 1

INTRODUCTION

1.1. Study background

Antioxidants are organic molecules capable of enhancing health by protecting human body against damaging free radicals and reactive oxygen species (ROS) (Goufo & Trindade, 2014). The damaging effect caused by these free radicals due to an imbalance state between pro-oxidant and antioxidant which known as oxidative stress (Valko et al., 2007). Both free radicals and reactive oxygen species are responsible for numerous degenerative and chronic diseases such as cancer and heart disease (Prior & Cao, 2000; Sen, Chakraborty, Sridhar, Reddy, & De, 2010). Numerous synthetic antioxidants are used in food industry, but several experimental evidences have reported its shortcomings and possible poisonous effects on health status. Therefore, consumers have become aware on other potential health beneficial antioxidant derived from natural sources such as plants. A large group of plant-derived metabolites compounds known as phytochemicals which comes from foods rich in cereals, beans, botanicals and beverages made from plants such as tea and wine are considered to play a major role in protecting human against diseases (Sethiya, Trivedi, & Mishra, 2014).

Phenolic antioxidants are one of the many bioactive compounds which can be found in rice that potentially have the ability to reduce incidence of diseases by inhibition of platelet aggregation, reduction in risk of cancer and cardiovascular disease as well as preventing damage on lipid and low-density lipoproteins caused by oxidative stress. In addition, phenolic acids such as ferulic acid, p-coumaric and diferulate that are considered special can only be found in significant amount in rice compared to other botanicals (Sunan Butsat & Siriamornpun, 2010). A group of phenolics known as flavonoid are an oxygenated heterocyclic ring which is made up of two aromatic rings