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CHEMICAL CONSTITUENTS AND BIOLOGICAL ACTIVITIES OF *SYZYGIUM FILIFORME* VAR. *FILIFORME* STEM BARK

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ABSTRACT

The stem bark of *Syzygium filiforme* var. *filiforme* from family of Myrtaceae was investigated for its chemical constituents and biological activities. About 3 kg of the stem bark was extracted successively using solvent of different polarity. Various chromatographic methods were used to isolate and purify compounds from dichloromethane and methanol extracts such as vacuum liquid chromatography, glass column, centrifugal thin layer chromatography, thin layer chromatography and preparative thin layer chromatography. This study resulted in the isolation of five pentacyclic triterpenoids and two phytosterols which are 2α, 3β, 23-trihydroxyolean-12-en-28-oic acid (arjunolic acid, **SF1**), 2α, 3β-dihydroxylup-20(29)-en-28-oic acid (alphitolic acid, **SF2**), 3β-hydroxylup-20(29)-en-28-oic acid (betulinic acid, **SF3**), 3β-hydroxyurs-12-en-28-oic acid (ursolic acid, **SF4**), ursolic acid 3-methyl ester (**SF5**), β-sitosterol (**SF6**) and stigmasterol (**SF7**). Structural identification was accomplished using spectroscopic methods such as ultraviolet (UV), infrared (IR), mass spectroscopy (MS), 1D and 2D nuclear magnetic resonance (NMR) (HMBC and HMQC). The methanolic extract showed moderate activities with IC_{50} values of 44.7±6.42 µg/mL compared to ascorbic acid (IC_{50} = 7.9±1.20 µg/mL) for DPPH assay but good activity for α-glucosidase assay with IC_{50} values of 6.31±0.90 µg/mL compared to 1-deoxynojirimycin (IC_{50} = 103.79±6.36 µg/mL). Dichloromethane and hexane extracts showed weak activity on DPPH assay but dichloromethane extract showed good activity for α-glucosidase assay. Major compounds **SF1**, **SF2**, **SF3** and **SF4** were tested for DPPH and showed no promising activity. **SF1**, **SF2**, **SF3** and **SF4** were also tested for α-glucosidase assay but only **SF1** and **SF3** gave moderate activity with IC_{50} values of 562.34±11.80 and 501.19±8.20 µM, respectively. The crude extracts and major compounds were also tested on antibacterial activity against *Escherichia coli*, *Staphylococcus aureus* and *Bacillus subtilis*. The methanolic and hexane extracts showed inhibition on tested organisms but no inhibition from dichloromethane extract. **SF1** showed inhibition against *E. coli*, *B. subtilis* and *S. aureus* with minimum inhibition concentration at 1800 µg/mL, 900 µg/mL and 450 µg/mL, respectively. **SF2** showed inhibition against *S. aureus* at 900 µg/mL. Then, **SF4** showed inhibition against *E. coli* at 1800 µg/mL and no inhibition showed by **SF3** on tested bacteria. The MBC values of hexane extract, **SF1** and **SF4** against *E.Coli*. Methanol and hexane extracts showed inhibition on *S. Aureus* with MBC values of 1000 and 1100 µg/mL, respectively. Meanwhile, **SF1** and **SF2** showed MBC values of 560 and 1000 µg/mL, respectively against same bacteria. Finally, there are only hexane extract and **SF1** showed inhibition at high concentration against *B. subtilis* with MBC values 1800 and 1100 µg/mL, respectively.

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TABLE OF CONTENTS

	Page
AUTHOR'S DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF SCHEMES	xi
LIST OF SYMBOLS	xii
LIST OF ABBREVIATIONS	xiii
CHAPTER ONE: INTRODUCTION	1
1.1 Research Background	1
1.2 Problem Statement	2
1.3 Objectives of Study	3
CHAPTER TWO: LITERATURE REVIEWS	4
2.1 The Family Myrtaceae	4
2.1.1 The Botany and Morphology of the Myrtaceae	5
2.1.2 Traditional and Medicinal Uses of Myrtaceae Plants	6
2.2 The Botany, Morphology and Medicinal Uses of *Syzygium* Genus	8
2.3 *Syzygium filiforme* var. *filiforme*	10
2.4 Chemical Constituents of *Syzygium* Species	11
2.4.1 Terpenoids	11
2.4.2 Flavonoids	16
2.5 Biological Activity of *Syzygium* Species	18
2.6 Biosynthesis of Triterpenoids	21

CHAPTER ONE
INTRODUCTION

1.1 RESEARCH BACKGROUND

Phytochemicals are chemical constituents or substances present in plants. They usually have characteristic pharmacological or biological activities. Over the years, these natural products have been used in traditional medicines as well as developed into modern drugs. Drugs derived from plant sources have been used in treatment of various human disorders for thousands of years in the form of the traditional Ayurvedic and Chinese medicine. Some popular examples of drugs from natural products are aspirin from willow bark and morphine from opium poppy. During 1960's, the studies of natural products served as the principle driving force for the new discovery of chemical reactivity (Bankova, 2007). These studies help natural product chemists to find out the main compounds that play a role as bioactive substances. In search bioactive compounds, research in phytochemistry focusing on medicinal plants are actively pursued in many countries all over the world.

The benefits of medicinal plants to treat diseases are also a reason for phytochemist to use plant as a source of medicinal agents. In the Quran and the Bible, about 20 and 125 plants are mentioned, respectively, as being used as medicinal agents to treat various ailments Jantan (2004). The gifts from the Creator are very invaluable and interesting because the diversity of living organisms in different part of the world. There are more than 35,000 plant species have being used in various human cultures around the world for medicinal purposes (Philip *et al.*, 2009). Malaysia is a beautiful country with variety of flora and fauna. It's location near the equator results in constantly warm and damp climate throughout the year. About 1,200 species of higher plants in Peninsular Malaysia and 2,000 species in Sabah and Sarawak are reported to have medicinal value and have been used for generations in various traditional health care systems (Philip et al., 2009). The importance of Malaysia's diverse medicinal plants lies not only in their chemotherapeutic value in traditional health care but also in their potential as source of new chemical entities for drug discovery (Rain et al., 2007). This has spurred a lot of research interest on the