UNIVERSITI PUTRA MALAYSIA

CYTOTOXIC EFFECTS OF METHANOLIC EXTRACTS OF *Psidium guajava* AND *Morinda citrifolia* ON HUMAN OSTEOSARCOMA SAOS-2 CELLS

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PENGESAHAN

Dengan ini adalah disahkan bahawa projek yang bertajuk "Cytotoxic effects of methanolic extracts of *Psidium guajava* and *Morinda citrifolia* on human osteosarcoma Saos-2 cells" telah disiapkan serta dikemukakan kepada Jabatan Mikrobiologi oleh Choo Jie Ying (165117) sebagai syarat untuk kursus BMY 4999 projek.

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ABSTRACT

Cancer is a major health problem and causes significant morbidity and mortality. Bone cancer is an uncommon cancer that begins in a bone and it mostly occurs in children and teens. Cancer treatment by conventional medicine, surgery, chemotherapy and radiotherapy have been the primary approaches, but they are not always effective. The use of complementary alternative medicine (CAM) has grown rapidly in popularity both among the general population and among cancer patients. Therefore, we hypothesize that plant extracts exert antiproliferative effect on cancer cells. The objective of this study is to evaluate the antiproliferation effects on cancer cells using selected plant extracts. Results showed that *Psidium guajava* extracts showed cytotoxic effect on human Saos-2 cells, however, *Morinda citrifolia* extracts do not exhibit any inhibition on Saos-2 cells. *P.guajava* leaves have more cytotoxic effects than *M.citrifolia* leaves. Further study of *P. guajava* can be applied to determine the optimal concentration of a leaf extract for cancer treatment, while, *M. citrifolia* can be recommended for further study on wound healing effects.

ABSTRAK

Kanser merupakan masalah kesihatan utama dan punca utama morbiditi dan mortaliti. Kanser tulang adalah barah yang luar biasa yang bermula pada tulang dan ia kebanyakannya berlaku pada kanak-kanak dan remaja. Rawatan kanser secara perubatan konvensional seperti pembedahan, kemoterapi dan radioterapi telah menjadi pilihan utama, tetapi tidak sentiasa berkesan. Penggunaan perubatan sampingan dan alternative berkembang dengan pesat dalam popularity kedua-dua di antara penduduk umum dan di kalangan pesakit-pesakit kanser. Oleh itu, kami hipotesis bahawa ekstrak tumbuhan mengenakan antiproliferatif kesan ke atas sel-sel kanser. Objektif kajian ini adalah untuk menilai kesan antiproliferasi ke atas sel-sel kanser oleh tumbuh-tumbuhan penyelidikan. Hasil kajian menunjukkan bahawa *Psidium guajava* ekstrak menunjukkan kesan sitotoksik ke atas sel manusia, Saos-2, Walau bagaimanapun, *Morinda citrifolia* ekstrak tidak mempamerkan apa-apa kesan pada sel-sel Saos-2. Daun *P.guajava* mempunyai lebih banyak kesan sitotoksik daripada daun *M.citrifolia*. Penyelidikan lanjutann daripada *P.guajava* boleh dibuat untuk menentukan kepekatan optimum ekstrak daun untuk rawatan kanser, sementara *M.citrifolia* boleh mengesyorkan kepada satu kajian tentang kesan-kesan penyembuhan luka.

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LIST OF ABBREVIATIONS

ATCC	American Type Culture Collection
CAM	Complementary alternative medicine
DMEM	Dulbecco's Modified Eagle's Medium
DMSO	Dimethyl Sulfoxide
FBS	Fetal bovine serum
HSC	Hematopoietic stem cell
LLC	Lewis lung carcinoma
MTT	3-(4,5-Dimethyl-2-thiazolyl)-2,5-diphenyl-2H-tetrazolium bromide
PBS	Phosphate Buffered Saline
OS	Osteosarcomas
x g	Times gravity

CHAPTER 1

INTRODUCTION

Today, cancer is still one of the key global healthcare challenges claiming millions of lives every year (Arome and Amarachi, 2014). Extensive research has progressed to achieve better understanding of the molecular basis of cancer over the past 30 years (Kundap and Sawade, 2013). Cancer is a condition where cells grow in a specific part of the body and reproduce uncontrollably. The cancerous cells can invade and destroy surrounding healthy tissue, including organs (Saxena et al., 2014). Metastasis is a process which spread and growth of tumor cells at distant organs (Kang et al., 2003). Bone cancer occurs in patients with primary bone tumors and is the most common site of the metastasis in patients with breast cancer, affecting up to 90% of women with advanced disease (Luger et al., 2001 and Body et al., 2003).

Cancer treatment by conventional medicine, surgery, chemotherapy and radiotherapy have been the primary approaches, but they are not always effective (Hsiao and Liu, 2010). Today, the increasing interest in complementary alternative medicines (CAM) among cancer patients may be due to limitations of conventional cancer treatment, increased advertising and media coverage of CAM, or the desire for holistic or natural treatments (Richardson et al., 2000). Medicines which are derived from plants have contributed in human health and well beings (Iwu et al., 1999), on the other hand, herbs were already used as a medicine since ancient times (Calixto, 2000). These medicinal plants can produce a definite physiological action on human body due to some chemical substance in the plants (Edeoga, 2005). Plants act as

reservoirs for a wide variety of secondary metabolites including alkaloids, flavonoids, tannins and terpenoids, which possess therapeutic properties (Khan et al., 2015). Several of herbs have shown antiplatelet, antitumor, hypolipidemic, or immune-stimulating properties that may add on useful in helping reduce the risk of heart disease and cancer (Craig, 1999).

The prevalence of cancer is on a steady increase every year, hence, new therapeutic strategy specifically targeting these cancer cells are needed. We hypothesize that the methanolic plant extracts of *Psidium guajava* and *Morinda citrifolia* can show the cytotoxic effect towards the bone cancer cell line. The main objective of this study is to evaluate the cytotoxic effect of the methanolic plant extracts, *Psidium guajava* and *Morinda citrifolia* on the cancer cells.

To achieve this experiment, three specific aims were planned. They are:

1. To prepare the crude methanolic extract of *P. guajava* and *M. citrifolia.*
2. To optimize the cell density and DMSO concentration.
3. To evaluate the cytotoxic effect of *P. guajava* and *M. citrifolia* toward Saos-2 cell lines.

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