



Phytochemistry

Volume 4

Fundamentals, Modern Techniques,
and Applications



Editors

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GAS CHROMATOGRAPHY–MASS SPECTROMETRY ANALYSIS AND IN VITRO ANTICANCER ACTIVITY OF *TECTONA GRANDIS* BARK EXTRACT AGAINST HUMAN BREAST CANCER CELL LINE (MCF-7)

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ABSTRACT

This chapter presents an investigation of the presence of secondary metabolites in the ethyl acetate extract of *Tectona grandis* bark extract and the cytotoxic effect against MCF-7 cell lines. Phytochemical compounds were determined by gas chromatography–mass spectrometry (GC-MS) analysis. The cytotoxic activity, morphological assessment of cell death, potential of mitochondrial membrane potential and deoxyribonucleic acid (DNA) damage pattern were evaluated by MTT assay, acridine orange/ethidium bromide (AO/EB) staining technique, JC-1 staining method and comet assay, respectively. GC-MS chromatogram showed the presence of five major phytochemical compounds in ethyl acetate extract of *T. grandis* bark which includes flavonoids, phenols, and tannins. The inhibition concentration (IC_{50}) of ethyl acetate extract of *T. grandis* bark was calculated as 1.57 mg/mL for MCF-7 cell line and induced significant DNA damage. Thus, the present study concludes that the ethyl-acetate extract of *T. grandis* bark possesses potent antibreast cancer activity.

23.1 INTRODUCTION

Cancer is a disease which is caused by many external, internal and hereditary factors. Among the different types of cancer, breast cancer is very common in women around the world and also leading cause of death (American Cancer Society, 2012). It is most difficult to cure due to several distinct classes of tumors that exhibit different treatment responses (Ferguson et al., 2004). The common treatments of cancer were chemotherapy, radiotherapy, hormonal therapy, or surgery, which cause many side effects (Stopeck and Thompson, 2012). Thus, the identification of novel anticancer agents without side effects is urgently needed (Lachenmayer et al., 2010). Medicinal plants possess tremendous pharmacological significance in producing drugs for various disease (Baker et al., 2007; Harvey, 2008) including cancer (Newman and Cragg, 2012; Kuno et al., 2012). The vast number of drugs such as paclitaxel, etoposide, camptothecin, vinca and indole alkaloids, podophyllotoxin derivatives, etoposide, and teniposide, were currently used in chemotherapy, which originally came from plants. *Tectona grandis* (Verbenaceae) is commonly known as teak. Traditionally, it is used in treatment of many diseases such as diabetes, lipid disorders, inflammation, ulcer, and bronchitis (Warrier, 1994) and also reported to have many biological processes such as antimicrobial and antiulcer activities (Pandey et al., 1982). Khan and Miungwana (1999) reported that a compound 5-hydroxylapachol isolated from *T. grandis* had potent cytotoxic activity. However, no studies were available on anti-breast cancer activity. The present investigation was undertaken to examine the anticancer activity of ethyl acetate extract of *T. grandis* bark against MCF-7 cell lines (human breast cancer cell line).

23.2 MATERIALS AND METHODS

23.2.1 COLLECTION OF PLANT MATERIAL

The bark of *T. grandis* was selected for this study. The barks were collected from Kunnathur, (Latitude 11.2667°N and Longitude 77.4090°E), Tirupur, Tamilnadu, India. They were thoroughly washed with tap water and dried under shadow. Then they were well using domestic grinder.

23.4 CONCLUSION

The bark extract of *T. grandis* examined in this study possess varying levels of in vitro anticancer activity. Different anticancer effects were examined and found to take part in the present study. The first is cytotoxicity (decreased number of live cells), measurement of cell death by apoptosis, mitochondrial membrane potential by fluorescent probe, and measurement of DNA deterioration by comet assay. The ethyl acetate extract of *T. grandis* has possessed all of the above effects with varying degrees.

ACKNOWLEDGMENT

We would like to thank the Management, the Principal and HOD of Zoology, Nehru Memorial College, Puthanampatti, Tiruchirappalli district, Tamilnadu, India for their encouragements and for providing necessary facilities. We also thank Dr. M. Akbarsha, Director, Mahatma Gandhi Doerenkamp Centre for alternatives to use of animals in life science education, Bharathidasan University, Tiruchirappalli for giving permission to do cell line work at his centre. The first author wishes to thank the University Grants Commission, New Delhi, for financial support.

KEYWORDS

- phytochemistry
- cytotoxicity
- *Tectona grandis*
- MCF-7 cell line
- comet assay

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