Potential Cytotoxic Isolates of Spigelia anthelmia Linn. against T47D and WiDr Cancer Cells

Tropical Journal of Natural Product Research • Article • *Open Access* • 2025 •
DOI: 10.26538/tjnpr/v9i12.44

Taupik, Muhammad [a] ; Fakhruddin, Nanang [b] ; Mustapa, Mohamad A. [a] ; Djuwarno, Endah N. [a] ; Ahmed, Qamar U. [c]

[a] Department of Pharmacy, Faculty of Sports and Health, Gorontalo State University, Gorontalo, 96211, Indonesia

Abstract

Natural products continue to provide valuable leads for anticancer drug discovery, yet limited studies have addressed the bioactive constituents of Spigelia anthelmia Linn. This research aimed to isolate and characterize cytotoxic metabolites of S. anthelmia using a bioassay-guided isolation approach. Sequential extraction, vacuum liquid chromatography (VLC), and preparative thinlayer chromatography (PTLC) yielded a semi-purified fraction designated as Isolate A. Cytotoxicity was evaluated against T47D breast cancer and WiDr colon cancer cells using the MTT assay. Isolate A significantly reduced cell viability in a dose-dependent manner (ANOVA, $p < 0.05$), with IC_{50} values of 166.92 ± 5.10 µg/mL (T47D) and 245.24 ± 6.25 µg/mL (WiDr), whereas doxorubicin exhibited IC_{50} values of 40.05 ± 2.30 µg/mL and 3.57 ± 0.45 µg/mL, respectively. Flow cytometry with Annexin V–FITC/PI staining revealed a visible shift of cell populations toward early and late apoptotic

quadrants, indicating apoptosis as the predominant mechanism of cell death. Spectroscopic characterization by FTIR, LC–MS, and NMR suggested that Isolate A is a phenolic/alkaloid-type compound (m/z 218 $[M+H]^+$) containing hydroxyl, carbonyl, and heteroaromatic groups. Collectively, these findings demonstrate that S. anthelmia contains apoptosis-inducing metabolites with measurable cytotoxicity, supporting its potential as a natural source of anticancer leads and warranting further purification and mechanistic investigation. To our knowledge, this is the first study to combine bioassay-guided isolation, apoptosis profiling, and spectroscopic characterisation of S. anthelmia metabolites in T47D and WiDr cancer cells. © 2025 Taupik et al.

Author keywords

Apoptosis; Bioassay-guided isolation; Cytotoxicity; Phenolic alkaloids; Spectroscopic characterization; Spigelia anthelmia

Indexed keywords

EMTREE drug terms

alkaloid; antineoplastic agent; doxorubicin; phytochemical; plant extract; protein bcl 2

EMTREE medical terms

apoptosis; Article; bioassay; breast cancer; cancer cell; carbon nuclear magnetic resonance; cell viability; colon cancer cell line; cytotoxicity; female; flow cytometry; fraction absorbed; human; human cell; IC50; liquid chromatography; liquid chromatography-mass spectrometry; metabolite; MTT assay; proton nuclear magnetic resonance; spectroscopy; T-47D cell line; thin layer chromatography; WiDr cell line

Device trade names

Commercial names given to devices, used for branding and differentiation in the market, commonly referenced in scientific and clinical research.

Tradename	Country	Manufacturer
FTIR 100	United States	Perkin Elmer

Chemicals and CAS Registry Numbers

Unique identifiers assigned by the Chemical Abstracts Service (CAS) to ensure accurate identification and tracking of chemicals across scientific literature.

doxorubicin	23214-92-8, 25316-40-9
protein bcl 2	219306-68-0

Funding details

Details about financial support for research, including funding sources and grant numbers as provided in academic publications.

Funding sponsor	Funding number	Acronym
Universitas Gadjah Mada See opportunities by UGM		UGM
Gorontalo State University		

Funding text
The authors gratefully acknowledge the academic support and laboratory facilities provided by the Faculty of Pharmacy, Gadjah Mada University, Indonesia and Faculty of Sports and Health, Gorontalo State University, Indonesia.

Corresponding authors

Corresponding author	M. Taupik
Affiliation	Department of Pharmacy, Faculty of Sports and Health, Gorontalo State University, Gorontalo, 96211, Indonesia
Email address	muhtaupik@ung.ac.id

Abstract

Author keywords

Indexed keywords

Device trade names

Chemicals and CAS Registry Numbers

Funding details

Corresponding authors

About Scopus

What is Scopus

Content coverage

Scopus blog

Scopus API

Privacy matters

Language

日本語版を表示する

查看简体中文版本

查看繁體中文版本

Просмотр версии на русском языке

Customer Service

Help

Tutorials

Contact us

ELSEVIER