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Antiproliferative and cytotoxic effects of *Boerhaavia diffusa*-derived sitosteryl oleate and its derivatives in human glioblastoma (U-87) cells

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Phytosterols present in free form and in esterified form with fatty acids, sugar moieties, or phenolic acids show antiproliferative properties on several cancers. This study reports the isolation, characterisation, and evaluation of the bioactive anticancer ester, sitosterol oleate (BDPT-3), from *Boerhaavia diffusa*, which induced significant cell death in U-87 MG cells with an IC₅₀ of 184 μ M. A cell viability assay showed that it significantly inhibited U-87 cell proliferation. Morphological changes, DNA fragmentation, AO/EB staining, and cell cycle analyses in U-87 cells confirmed that it induced apoptosis. It altered the Bax/Bcl-2 ratio by decreasing BCL-2 expression while Bax expression was relatively constant. Further, sitosteryl oleate and its analogues were synthesised, characterised, and evaluated for antiproliferative activity. Among them, butanoate (2c), pentanoate (2d), and decanoate (2h) derivatives showed IC₅₀ values between 60 and 70 μ M, and benzoate (2j) showed an IC₅₀ value of 91.77 μ M after 72h. Further *in vitro* and *in vivo* studies are needed to validate their therapeutic potential against glioblastoma.

Keywords: Apoptosis, *Boerhaavia diffusa*, Cytotoxic, Glioblastoma, Phytosterols, Sitosteryl oleate

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