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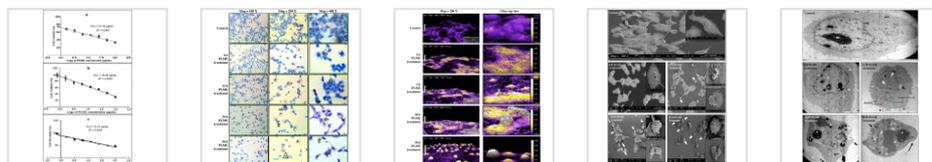
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Figures (5)



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Original article

Standardized *Polyalthia longifolia* leaf extract (PLME) inhibits cell proliferation and promotes apoptosis: The anti-cancer study with various microscopy methods

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Abstract

Over the years a number of **microscopy** methods have been developed to assess the changes in cells. Some non-invasive techniques such as holographic digital microscopy (HDM), which although does not destroy the cells, but helps to monitor the events that leads to initiation of apoptotic cell death. In this study, the apoptogenic property and the **cytotoxic effect** of *P. longifolia* leaf methanolic extract (PLME) against the human cervical carcinoma cells (HeLa) was studied using light microscope (LM), holographic digital microscopy (HDM), scanning **electron microscope** (SEM) and transmission electron microscope (TEM). The average IC₅₀ value of PLME against HeLa cells obtained by MTT and CyQuant assay was 22.00 µg/mL at 24 h. However, noncancerous **Vero cells** tested with PLME exhibited no cytotoxicity with the IC₅₀ value of 51.07 µg/mL at 24 h by using MTT assay. Cytological observations showed nuclear condensation, cell shrinkage, multinucleation, abnormalities of **mitochondrial** cristae, **membrane blebbing**, disappearance of microvilli and **filopodia**, narrowing of **lamellipodia**, holes, formation of numerous smaller **vacuoles**, **cytoplasmic** extrusions and formation of apoptotic bodies as confirmed collectively by HDM, LM, SEM and TEM. In conclusion, PLME was able to produce distinctive morphological features of HeLa cell death that corresponds to **apoptosis**.

Keywords

Apoptosis; CyQUANT assay; Electron microscopy; HeLa cells; Holography image

1. Introduction

Chemotherapy is a well-recognised treatment for cancer although the delivery of drugs depicts poor selectivity and still exerts adverse side effects. Nonetheless, when these **cancer cells** appear to be resistant, the treatment further seems less ineffective.

Consequently, the discovering of novel drugs with relatively high selectivity and fewer side effects has become an urgent quest for attention. Medicinal plants are used for centuries by traditional healers in treating diverse maladies that initiated the beginning phase of modern medicine. By understanding the molecular mechanism elicited by various medicinal plants, interfering and obstructing **cell signalling** pathways reserved as new strategic to target numerous cancers. Due to the fact that the *P. longifolia* posed many useful contributions in traditional medicine [1,2], it is noteworthy to investigate its benefits in combating cancers. Hence, the present study was designed to evaluate the **cytotoxicity** and determines the mode by which cell death was inflicted by *P. longifolia* leaf methanolic extract (PLME) in HeLa using distinct microscopic techniques.

Apart from other cell death modes, apoptotic cells have the tendency to demonstrate classic, well-defined morphological changes such as **membrane blebbing**, **chromatin condensation**, **chromatin** margination to **nuclear membrane**, nuclear **fragmentation** (karyorrhexis) and formation of apoptotic bodies [3]. The disadvantages of biochemical