

The nature of apoptosis of human breast cancer cells induced by three species of genus *Ganoderma* P. Karst. (Aphyllophoromycetideae) crude extracts

ABSTRACT

The cytotoxic effect of crude extracts of three *Ganoderma* species (*G. lucidum*, *G. tropicum*, and *G. tsugae*) was screened against the human estrogen-independent cell line, MDA-MB-435 using a microculture tetrazolium (MTT) assay. The crude extract obtained from the fruiting body of *Ganoderma lucidum* by hot water extraction procedures had IC₅₀ values ranging from 140 to 350 μ g mL⁻¹. Acridine-orange/propidium iodine staining, electron microscopy, and transmission electron microscopy showed that the crude extract caused both apoptosis and necrosis. The *G. lucidum* mycelial crude extract was most effective, with an IC₅₀ value of 148 μ g mL⁻¹.

Keyword: Apoptosis; *Ganoderma*; IC₅₀; Ling Zhi mushrooms; MDA-MB-435; Medicinal mushrooms; Mycelium; Necrosis