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Evaluation of antioxidant, antibacterial and anticancer activities of *Ganoderma lucidum* extracts

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ABSTRACT

G. lucidum is an oriental fungus loaded with antioxidant, antimicrobial and anticancer properties. *G. lucidum* extracts obtained by using soxhlet and Ultrasonic-Assisted Extraction (UAE). The antioxidant properties determined by DPPH assay resulting in IC50 value of extract for soxhlet water 372.21 μg/mL followed by soxhlet ethanol 431.00 μg/mL, UAE ethanol 541 μg/mL and UAE water 560.90 μg/mL shown weak antioxidant properties. Well plate diffusion used for antimicrobial activity test against *S. aureus* and *E. coli*. UAE water extract shows highest antibacterial properties against *S. aureus* (20–23) mm followed by soxhlet water extract (6–13) mm. The ethanol extract for both soxhlet and UAE are (5–13) mm and (4–14) mm respectively. *G. lucidum* extract exhibited zero inhibition zone against *E. coli* due to presence of barrier membrane. CCK-8 used to test anticancer activity against MCF-7 cells. The IC50 values of soxhlet ethanolic extract is 4.797 μg/mL followed by UAE ethanolic extract 5.291 μg/mL, soxhlet water extract 7.196 μg/mL and UAE water extracts 9.455 μg/mL. The lower IC50 value indicated that the extracts inhibited cell viability of MCF-7.

1. Introduction

Ganoderma Lucidum (G. lucidum) is an oriental fungus anciently utilized by promoting both longevity and health in Asian countries such as Japan and China. *G. lucidum* (Fig. 1) is large and dark woody texture mushroom top with glossy exterior that usually grown on surface of hardwoods or sometimes on the roots or stumps of extensive range of deciduous hosts [1]. *G. lucidum* known in China as Lingzhi, Japan as Reishi and South Korea as Yeongji. [2,3,4]. *G. lucidum* has the general characteristic of Ganodermataceae family with complex spore wall comprised of the outermost primary layer, innermost secondary pigmented layer and darkly stained interwall pillars which are surrounded by electron transparent regions. The shape of basidiospores is ovate with truncated apex, complemented quite amount of narrow inter-wall pillars and smooth wall. Its basidiocarp is stipitate with a pileus which is covered with a dark-red laccate layer. The pilocystidia are medium long, clavate, thick-walled with tapering shafts. Based on fruiting bodies there are six colour of *G. lucidum* such as blue, purple, yellow, white, red and black [5,6,7].

Components of bioactive chemical molecules extracted from *G. lucidum* differ depending on the parts of its structures such from fruit body, mycelium or spores. Both Fruit body and mycelium of *G. lucidum* consists of Beta-D glucan, ganoderic acid, cellulose-digesting enzymes. Fruit body contained adenosine, Ganoderans and D-6 while ganodosterone, ganodermic acid were found in mycelium [5]. *G. lucidum* extract can be obtained using solid–liquid extraction method. The commonly used techniques for *G. lucidum* extraction are Soxhlet extraction and Ultrasound-assisted extraction (UAE). Soxhlet extraction technique is a traditional approach used large amount of solvents and time-consuming method but able to obtained and recover more active compounds from solid materials compared to other techniques. Ultrasound-assisted extraction (UAE) is an alternative to traditional extraction technique that can extract high quantities of bioactive compounds in much shorter time with low costs of operations [9].

G. lucidum practically used in medicine production for diseases such as chronic hepatitis, insomnia, inflammation, cancer and bronchitis

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