

# Antimicrobial and Antagonistic Properties of *Ganoderma lucidum* (W.Curt.: Fr.) Lloyd

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*Ganoderma lucidum* is a Basidiomycetes fungus belonging to the family Ganodermataceae. Several studies have shown that *Ganoderma* spp. are selected as potent sources of antimicrobial compounds. To prove this potential and to show the antagonistic properties of *G. lucidum* against a number of bacteria and fungi, this study was conducted.

Antimicrobial test were carried out of crude extracts recovered from dried powdered *G. lucidum* fruit bodies using solvents with different concentration (25%, 50%, 75%, and 100%) of butanol (BuOH), ethanol (EtOH), methanol (MeOH), and water against bacteria (*Bacillus subtilis* 010 and *Escherichia coli* 002) and fungi (*Aspergillus niger* 3029 and *Trichoderma viride* 4012). Results were obtained after 24 hours for bacterial test organisms and 5 days for fungal test organisms.

The dual culture method was adapted in *in vitro* antagonism of *G. lucidum*. *G. lucidum* against isolates of fungi such as *A. niger* 3029, *Penicillium chrysogenum* 5533, *Rhizopus oryzae* 5011, and *T. viride* were grown in potato dextrose agar (PDA).

Results on antimicrobial test showed that *G. lucidum* extracts recovered using various solvents exhibited a static (inhibitory) effect on both bacteria and fungi. All crude extracts showed strong

inhibition against *B. subtilis*, *E. coli*, and *A. niger*. On the other hand, the least static effect was obtained against *T. viride* by *G. lucidum* extracted using 25% EtOH. Extracts at 100% BuOH yielded the greatest zone of inhibition against test microorganisms. Water, the universal solvent, was shown to be an equally good extractant—*G. lucidum* extracts using water also exhibited antimicrobial activity against all test organisms.

Evaluation of *in vitro* organism of *G. lucidum* against *P. chrysogenum*, *R. oryzae*, and *T. viride* resulted in the test organisms' inability to produce spores, showing that spore formation was destabilized. On the other hand, *A. niger* and *G. lucidum* were shown to be able to live harmoniously in the same plate.

Further studies on the antimicrobial property of *G. lucidum* on other pathogenic microorganisms and viruses are recommended. Studies on antagonistic property against other fungi, specifically those with a longer mycelial stage—e.g. *Penicillium* spp.—are also recommended. Likewise, purification of  $\beta$ -D-glucans, a water-soluble polysaccharide, to which the antimicrobial property is attributed, should also be considered. And, because *G. lucidum* extract is water-soluble, the use of *G. lucidum* as tea can also be recommended.