



QUANTIFICATION OF POLYSACCHARIDES IN MEDICINAL MUSHROOM PREPARATION ORIENS® REISHI GANODERMA FOR DIETARY SUPPLEMENTATION

Sekar Sasikala*

R&D Department, Oriens Global Marketing (P) Ltd, Aminjikarai, Chennai, Tamilnadu, India *Corresponding Author

Kumar Deeptha

R&D Department, Oriens Global Marketing (P) Ltd, Aminjikarai, Chennai, Tamilnadu, India

ABSTRACT

Ganoderma lucidum is a prominent medicinal mushroom which has been used in Oriental medicine for centuries. The objective of the present study was to quantify the polysaccharides present in the preparation Oriens® *Reishi ganoderma* using UV spectroscopy. Studying the absorbance using UV spectrophotometer showed that the preparation contained 50.98% of polysaccharides. Given the antioxidant and anti-cancer effects of the *Ganoderma* polysaccharides, and the living culture of the present population, *Reishi ganoderma* can be used as an effective supplement to sustain health and well-being in humans.

KEYWORDS : *Ganoderma*, polysaccharides, human health, supplement, UV spectroscopy

Introduction

Ganoderma lucidum is a well known dark-colored mushroom with a long history of use for promoting health in South-east Asian countries. This fungus has a glossy exterior with a woody texture which is the reason behind its name 'lucidus' means "shiny" in Latin. (Wachtel-Galor et al., 2011). *Ganoderma* is very popular in traditional medicine and well recognized to exhibit immune stimulating effects especially against tumors (Gao et al., 2003; Shi et al., 2013; Sone et al., 1985). In addition to this *Ganoderma* extracts containing its polysaccharides have been reported in the treatment of hyperplasia, boost the immune system, improve the cardiovascular function, and even in the treatment of Lyme disease.

Such beneficial properties to human health of *Ganoderma* have been reported to be attributed to a wide variety of its bioactive ingredients among which its polysaccharides are considered as the most beneficial component (Wang et al., 2002; Ferreira et al., 2010). Recent reports indicate that (13), (16)- α / β -glucans, glycoproteins and water soluble heteropolysaccharides constitute to the majority of the bioactive *Ganoderma* polysaccharides (Nie et al., 2013) Also present are arabinose, fucose, galactose, glucose, mannose, and xylose in different quantities and varying glycosidic linkages, as well as peptide bonds (Chen et al., 2008; Wang and Zhang, 2009). These polysaccharides are highly complex biomolecules, and it is very important to study their concentration in nutritional supplements as it will help in deciding the dosage for ailments or its use generally as a supplement. In the present study we carried out quantification of total polysaccharides content in the medicinal mushroom preparation Oriens® *Reishi ganoderma* which is being used as a dietary supplement.

Materials and methods

Five grams of the content from Oriens® *Reishi ganoderma* capsules containing the extract powder was taken in a conical flask. To this 100 ml of distilled water was added and shaken well for two hours. The mixture was left overnight and on the next day the material was filtered to obtain a concentrate which volumes upto 10-15 ml. To this concentrate 50 ml of 90 percent methanol was added with stirring and left stationary for 30 minutes. The solution was filtered and the residue on filter paper was dried at 80 deg centigrade until it reached a constant weight.

To prepare blank solution 1ml of 5% phenol followed by 5ml of concentrated H_2SO_4 was added slowly to 1ml of distilled water added. Standards were prepared using this blank. Estimation of polysaccharide in the extract was measured by dissolving 1g of the residue in 10 ml of distilled water. From this 1ml was used for sugar analysis. To estimate the polysaccharide content 1ml of 5% phenol was added to the 1ml of *Ganoderma* solution, followed by addition of 5ml of concentrated H_2SO_4 . The absorbance was measured after

10 minutes at 488nm against blank. The experiment was carried out in triplicate (i.e. Test-1, Test-2 & Test-3).

Results and discussion:

Ganoderma has been traditionally involved in Oriental medicine and has been used to treat several ailments including Benign Prostatic Hyperplasia, Endocarditis, Lyme Disease and it also used as an Immune System Stimulant, has cardiovascular benefits. In the present study we measured the polysaccharides in Oriens® *Reishi ganoderma* capsules using UV method. The results obtained are given in Table 1.

Table 1. Fulvic acid content in Shilajit

Sample	Chemical analyzed	Results	Method used
Reishi Ganoderma (VNL-18-025)	Polysaccharide content	50.98%	UV method

Among the members of genus *Ganoderma*, the species *Ganoderma lucidum* has been widely studied for its polysaccharides and its bioactivities (Nie et al., 2013). *Ganoderma* polysaccharides in general are well known for their antioxidant properties which include free radicals scavenging, reducing power and chelating effects on ferrous ions, among others (Kozarski et al., 2011).

Further, the radicals scavenging activity can be attributed to the increase in levels of antioxidant enzymes superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GSH-Px) caused due to consumption of *Ganoderma* polysaccharides (XiaoPing et al., 2009). Moreover, the polysaccharides from *Ganoderma* are also well-known for their antitumor bioactivity through mechanisms that include enhancing the immune response of the host. (Mizuno et al., 1995). To be specific, the *Ganoderma* polysaccharides are related to the stimulation of production of immuno-molecules including interleukin (IL)-1 β , tumor necrosis factor (TNF)- α , IL-6 from human monocyte-macrophages, and interferon (IFN)-c from T lymphocytes (Wang et al., 1997).

Conclusions:

Ganoderma polysaccharides are well established for their antioxidant and anti-tumor mechanisms but knowledge on their antimicrobial activity of polysaccharides from *Ganoderma* species is highly limited (Skaliccka-Wozniak et al., 2012). Therefore, *Ganoderma* may be considered as a good health food supplement, especially for cancer patients. Nevertheless, the polysaccharides from the fungi would be a highly effective supplement for people living at the present time. With knowledge from further investigations, new nutraceuticals and pharmacological formulations can be developed using *Ganoderma* glycoproteins or polysaccharides.

Acknowledgment

The authors would like to express their deepest gratitude to P. Karthikeyan, CEO, S. Moulishankar, COO, S. Suman, CFO Oriens Global Marketing (P) Ltd, India for financial support for this study and permitting us to conduct this study. Our heartfelt thanks go to the Parthiban Subramanian for his guidance and support.

References:

- Chen, Y., Xie, M.-Y., Nie, S.-P., Li, C., Wang, Y.-X., 2008. Purification, composition analysis and antioxidant activity of a polysaccharide from the fruiting bodies of *Ganoderma atrum*. *Food Chem.* 107, 231–241.
- Ferreira IC, Heleno SA, Reis FS, Stojkovic D, Queiroz MJ, Vasconcelos MH, Sokovic M. Chemical features of *Ganoderma* polysaccharides with antioxidant, antitumor and antimicrobial activities. *Phytochemistry.* 114:38-55. doi: 10.1016/j.phytochem.2014.10.011.
- Ferreira, I.C.F.R., Vaz, J.A., Vasconcelos, M.H., Martins, A., 2010. Compounds from wild mushrooms with antitumor potential. *Anti-cancer Agents Med. Chem.* 10, 424–436.
- Gao Y, Zhou S, Jiang W, Huang M, Dai X. 2003. Effects of Ganopoly® (A *Ganoderma lucidum*
- Kozarski, M., Klaus, A., Niksic, M., Jakovljevic, D., Helsper, J.P.F.G., Griensven, L.J.L.D.V., 2011. Antioxidative and immunomodulating activities of polysaccharide extracts of the medicinal mushrooms *Agaricus bisporus*, *Agaricus brasiliensis*, *Ganoderma lucidum* and *Phellinus linteus*. *Food Chem.* 129, 1667–1675.
- Mizuno, T., Saito, H., Nishitoba, T., Kawagashi, H., 1995b. Antitumor active substances from mushrooms. *Food Rev. Int.* 11, 23–61.
- Nie, S., Zhang, H., Li, W., Xie, M., 2013. Current development of polysaccharides from *Ganoderma*: isolation, structure and bioactivities. *Bioact. Carbohydrates Dietary Fibre* 1, 10–20.
- Polysaccharide Extract) on the immune functions in advanced-stage cancer patients. *Immunological Investigations.* 32:DOI: 10.1081/IMM-120022979
- Skalicka-Wozniak, K., Szypowski, J., Łos, R., Siwulski, M., Sobieralski, K., Glowniak, K., Malm, A., 2012. Evaluation of polysaccharides content in fruit bodies and their antimicrobial activity of four *Ganoderma lucidum* (W. Curt.: Fr.) P. Karst strains cultivated on different wood type substrates. *Acta Soc. Bot. Pol.* 81, 17–21.
- Shi M, Zhang Z, Yang Y. 2013. Antioxidant and immunoregulatory activity of *Ganoderma lucidum* polysaccharide (GLP). *Carbohydrate Polymers.* 95(1):200-206x
- Sone Y, Okuda R, Wada N, Kishida E, Misaki A. 1985. Structures and Antitumor Activities of the Polysaccharides Isolated from Fruiting Body and the Growing Culture of Mycelium of *Ganoderma lucidum*. *Agricultural and Biological Chemistry.* 49 (9): 2641-2653.
- Wachtel-Galor S, Yuen J, Buswell JA, et al. *Ganoderma lucidum* (Lingzhi or Reishi): A Medicinal Mushroom. In: Benzie IFF, Wachtel-Galor S, editors. *Herbal Medicine: Biomolecular and Clinical Aspects.* 2nd edition. Boca Raton (FL): CRC Press/Taylor & Francis; 2011. Chapter 9.
- Wang, S.Y., Hsu, M.L., Hsu, H.C., Lee, S.S., Shiao, M.S., Ho, C.K., 1997. The antitumor effect of *Ganoderma lucidum* is mediated by cytokines released from activated macrophages and T lymphocytes. *Int. J. Cancer* 70, 699–705.
- Wang, Y.Y., Khoo, K.H., Chen, S.T., Lin, C.C., Wong, C.H., Lin, C.H., 2002. Studies on the immuno-modulating and antitumor activities of *Ganoderma lucidum* (Reishi) polysaccharides: Functional and proteomic analyses of a fucose-containing glycoprotein fraction responsible for the activities. *Bioorg. Med. Chem.* 10, 1057–1062.
- Wang, J.G., Zhang, L.N., 2009. Structure and chain conformation of five water soluble derivatives of a b-D-glucan isolated from *Ganoderma lucidum*. *Carbohydr. Res.* 344, 105–112
- XiaoPing, C., Yan, C., Shuibing, L., YouGou, C., JianYun, L., LanPing, L., 2009. Free radical scavenging of *Ganoderma lucidum* polysaccharides and its effect on antioxidant enzymes and immunity activities in cervical carcinoma rats. *Carbohydr. Polym.* 77, 389–393.