Research Article

Received: 25 December 2012  Revised: 18 February 2013  Accepted article published: 4 March 2013  Published online in Wiley Online Library

(wileyonlinelibrary.com) DOI 10.1002/jfsa.6121

Nutrient composition, antioxidant properties, and anti-proliferative activity of Lignosus rhinocerus Cooke sclerotium

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Abstract

BACKGROUND: Lignosus rhinocerus (tiger milk mushroom) is an important medicinal mushroom used in Southeast Asia and China, and its sclerotium can be developed into functional food/nutraceuticals. The nutrient composition, antioxidant properties, and anti-proliferative activity of wild type and a cultivated strain of L. rhinocerus sclerotia were investigated.

RESULTS: The sclerotial powder has high carbohydrate but low fat content. Interestingly, the cultivated strain contains higher amounts of protein and water-soluble substances than the wild type. Phenolic content of hot-water, cold-water, and methanol extracts of the sclerotial powders ranged from 19.32 to 29.42 mg gallic acid equivalents g⁻¹ extract, while the ferric reducing antioxidant power values ranged from 0.006 to 0.016 mmol m⁻¹ g⁻¹ extract. The DPPH⁺, ABTS⁺⁺, and superoxide anion radical scavenging activities of the extracts ranged from 0.52 to 1.12, 0.05 to 0.20, and 0.98 to 11.23 mmol Trolox equivalents g⁻¹ extract, respectively. Both strains exhibited strong superoxide anion radical scavenging activity comparable to rutin. The cold-water extracts exhibited anti-proliferative activity against human breast carcinoma (MCF-7) cells, with IC₅₀ values of 206 μg mL⁻¹ and 90 μg mL⁻¹ for the wild type and cultivated strains, respectively.

CONCLUSION: The cultivated L. rhinocerus sclerotium has the potential to be developed into functional food/nutraceuticals. © 2013 Society of Chemical Industry

Keywords: nutritional composition; phenolic content; antioxidant activity; anti-proliferative activity; Lignosus rhinocerus; tiger milk mushroom

INTRODUCTION

Mushrooms are perceived as a form of delicacy in most cultures, particularly for their special aroma and texture as well as for medicinal purposes. Lignosus rhinocerus (synonym: Lignosus rhinocerotis (Cooke) Ryvarden) is one of the most highly valued medicinal mushrooms by the natives of Malaysia.¹ The mushroom is known locally as 'cendawan susu rimau' (tiger milk mushroom) and the sclerotium is the part of the mushroom with medicinal value. It is used to treat a variety of diseases, including cancer, cough and asthma, and as a general tonic.² Current scientific literature has documented a number of bioactive properties of the sclerotium of L. rhinocerus such as enhancement of immunomodulatory activity and anti-proliferative effect against the human breast carcinoma (MCF-7) and lung carcinoma (A549).³,⁴

For many years, efforts to cultivate the mushroom have not been successful, and it can only be collected from the jungle. Since the existence of this mushroom in the jungle is always solitary, the collection of the sclerotium is a tedious process; as a result, L. rhinocerus sclerotium is not only costly but its supply is also limited, which probably accounts for the fact that the biopharmaceutical properties of the mushroom have not been well investigated.

Recently, Tan² reported successful cultivation of the mushroom with good yield, thus overcoming the cost and supply problem, and opening up the possibility of commercializing this mushroom and its extracts as functional food and nutraceuticals. An evaluation on the subacute toxicity of the sclerotial powder of both wild type and cultivated L. rhinocerus in Sprague Dawley rats indicated that the ‘no observable adverse effect level’ (NOAEL) dose is higher than 1 g kg⁻¹.⁶ Moreover, there are limited literatures reporting on the nutrient composition of L. rhinocerus sclerotium, though it has been reported that the main components of the dry matter were mostly carbohydrate, consisting of insoluble dietary fiber and non-starch polysaccharides, with low lipid content.⁷,⁸ Also, little is known about the antioxidant properties of the L. rhinocerus sclerotium. Thus, in this report, we examined the antioxidant activities of hot-water, cold-water, and methanol extracts (HWE, CWE and ME, respectively) of sclerotial powder of the wild type and cultivated

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