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SHORT COMMUNICATION

Selenium speciation and biological characteristics of selenium-rich Bailing mushroom, *Pleurotus tuoliensis*

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ABSTRACT

Nowadays the study of selenium-rich mushrooms is very popular. In the present study, selenium speciation in fruiting body of *Pleurotus tuoliensis* was investigated in cultivation substrates with different concentrations of sodium selenite, as well as mycelia growth and mushroom development. The results showed that the *P. tuoliensis* mycelia appeared good tolerance to selenium at all test concentrations. A selenium concentration of 10 mg/kg promoted fruiting of *P. tuoliensis*; the fruiting bodies were of good quality and had a low malformation rate. HPLC–ICP-MS determined that organic seleniums enriched in stipes and caps existed mainly in the form of selenoCystine and selenoMethionine at selenium concentrations of 10-100 mg/kg. These findings suggest that *P. tuoliensis* could be developed as a selenium-rich mushroom product for use as a novel dietary source of bioavailable supplemental selenium.

Keywords: Mycelia growth rate; *Pleurotus tuoliensis*; Selenium speciation; Selenium-rich product

INTRODUCTION

Selenium is an important trace element in the environment and a necessary component of selenocysteine and selenium enzymes, such as peroxidase, which have important biological functions, including cancer prevention (Pd 2004), antioxidation (Whanger 2002), immune stimulation (Silva et al., 2010), and HIV inhibition (Yu et al., 2007). Insufficient or excessive intake of selenium can lead to many diseases. Selenium poisoning causes symptoms such as nausea, upper abdominal discomfort, constipation and pain in the shoulder and foot (Hamilton 2004). However, an insufficient supply of selenium may cause growth retardation and dysfunctional bone metabolism, which can lead to abnormal thyroid function (Köhrle et al. 1992). Many diseases in humans and animals are closely associated with selenium deficiency, such as Kashin-Beck disease (Jie et al., 2017), atherosclerotic heart disease (Alehagen and Aaseth 2014), or diarrheal disease (Amare et al., 2011). Although selenium may be acquired from foods such as eggs, onions, malts, meat, mushrooms and nuts, its abundance in most natural and processed foods is low. It has been reported that certain endemic diseases such as Keshan disease and Kashin-Beck disease are prevalent in northeastern China and southeastern Siberia due to the insufficient amount of selenium in locally produced food. Therefore, it is necessary to add selenium to the diet in such regions to meet the requirements of the human body.

Mushrooms are excellent accumulators of minerals from the environments in which they grow. Mushrooms can accumulate selenium in their fruiting bodies when cultivation substrates are supplemented with selenium in the form of organic salt or inorganic salt. Cultivation of *Agaricus bisporus* on substrates supplemented with 0.6 mmol L^{-1} Se resulted in a 2.5-fold increase in the selenium content of the fruiting bodies (Rzymski et al., 2016). Moreover, selenium enrichment by *Cordyceps militaris* (Dong et al., 2013), *Pleurotus ostreatus* (Yan and Chang 2012) and *Lentinula edodes* (Ogra et al., 2004) was enhanced remarkably when they were grown on a selenium-enriched substrates. However, the ability of different species of mushrooms to accumulate selenium varies widely. For example, Jerzy Falandysz reported that the total selenium content in *Hericium erinaceus* and *Ganoderma lucidum* fruiting bodies grown on substrates with 0.1 mM inorganic selenium was 17.1 mg/kg DW and 28.3 mg/kg DW, respectively, while the control mushrooms had total selenium content of 14.1 mg/kg DW and 8.5 mg/kg DW, respectively (Niedzielski et al., 2014).

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