Growing Selenium-Enriched Mushrooms as Ingredients for Functional Foods or Dietary Supplements

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Selenium is a mineral micronutrient that has generated much recent interest in nutraceutical and medical research and the food industry. Selenium has numerous physiological functions but is best known as a necessary cofactor for the glutathione peroxidase enzyme system. This system is responsible for removing free radicals from the body, thus reducing oxidative damage. Owing to this potent antioxidant effect, selenium has been associated with the reduction of various chronic, degenerative diseases, including several types of cancer. *Agaricus* mushrooms normally contain about 1–2 ppm (d.w.), which makes them a good source of dietary selenium, since that amounts to about 15% of the USRDA in a serving (84 g). However, in an effort to capitalize on the popularity of functional foods and nutraceuticals, and create new market niches for mushrooms, the objective of this study was to develop a method to grow selenium-enriched mushrooms containing up to 1200 ppm (d.w.) that could function as a new organic selenium source to be used as an ingredient in functional foods or in the manufacture of dietary supplements.

In this study selenium was added to the compost by addition of different amounts of sodium selenite to a commercial compost supplement added at spawning to *Agaricus bisporus* (J. Lge) Imbach mushrooms grown in bags. Resultant selenium concentrations in the compost were 0.7 (control), 2.5, 30, 83, and 197 ppm (d.w.). Selenium uptake in the mushroom tissues fit a hyperbolic response curve. The linear portion of the curve corresponded to mushrooms containing up to 10 ppm and reached saturation at about 1200 ppm (d.w.). The linear portion of the curve could be used by commercial growers to produce mushrooms with desired selenium concentrations up to 100% of the RDA of selenium in a serving. Mushrooms containing 20% of the USRDA could be marketed as an excellent source of dietary selenium, but enriching to levels above that for direct human consumption is not currently advisable.

The upper limit (about 1200 ppm) of selenium attainable in mushrooms would be comparable to that of selenium-enriched yeast, which is commonly used in production of selenium mineral supplements. There was a significant negative effect on crop yield (up to 33% reduction) with mushrooms at higher selenium levels, but this occurred only at levels significantly exceeding what would be used by growers to produce mushrooms for direct consumer consumption. These results indicate the possibility of a market niche for selenium-enriched mushrooms that could be used as a new selenium source in dietary supplements or as a value-added ingredient for the formulation of functional foods or nutraceuticals.

1521-9437/00/$5.00