

Exploring the Impact of Ultraviolet B Irradiation on Nutritional Composition and Bioavailability of Mushrooms and Their Powders

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Outline

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2. Harnessing the potential of UVB irradiation for improving the nutraceutical properties of mushroom dried powder
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Abstract

With the rise of environmental sustainability initiatives, vegetarianism has gradually become a dietary trend. However, reducing the intake of animal-based foods may result in vitamin D deficiency. Therefore, increasing the vitamin D content of plant-based foods is an issue worthy of attention. Ergosterol ($C_{28}H_{44}O$), a component found in mushrooms, can be converted into vitamin D₂ (ergocalciferol, $C_{28}H_{44}O$) upon exposure to sunlight. This study discusses how ultraviolet B (UVB) irradiation affects the nutritional quality and bioavailability of mushrooms and their dried powders. Tiwari et al. (2021) found that UVB irradiation significantly increased the vitamin D content in both fresh mushrooms and mushroom powders, with the highest level observed after a 2-hour exposure at an intensity of 24 kJ m^{-2} , as determined by HPLC analysis. The irradiated samples also showed significantly higher levels of total phenols, total flavonoids, and β -glucans than the non-irradiated group. Moreover, antioxidant activity, as measured by DPPH, ABTS, and FRAP assays, was enhanced after UVB exposure. Some bioactive compounds not present in the control group were detected in the irradiated samples, including oleylamide (9-octadecenamide, Z) and ergost-7-en-3-ol (3β). Hidalgo-Sanz et al. (2023) reported that drying mushrooms at 40°C , compared to 80°C , increased vitamin D₂ content. Furthermore, UVB-irradiated, vitamin D₂-enriched shiitake mushroom powder was encapsulated, and a double-blind clinical trial was conducted with a placebo group and a vitamin D₂-enriched group. Results showed that participants in the vitamin D₂-enriched group had significantly higher serum 25-hydroxyvitamin D [$25(\text{OH})\text{D}$] concentrations in the first and second months. When analyzed separately by sex, both male and female participants in the vitamin D₂ group exhibited significantly higher serum $25(\text{OH})\text{D}$ levels at the second month compared with the control group. Therefore, consuming capsules enriched with vitamin D₂ can help prevent the winter decline in vitamin D levels caused by reduced sunlight exposure. In summary, UVB irradiation of mushrooms and their powders not only increases vitamin D₂ content but also enhances their health-promoting compounds, demonstrating potential for sustainable development and industrial applications.

1 參考文獻

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