Tropentag, September 10-12, 2025, hybrid conference

"Reconcile land system changes
with planetary health"

Enhancement of vitamin D2 content in *Lentinula edodes* through solar drying and ultraviolet irradiation

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Abstract

Vitamin D is essential for bone mineralisation and immune function, with deficiencies affecting over one billion individuals globally. Such deficiencies are associated with rickets, osteoporosis, and a range of chronic conditions. The primary sources of vitamin D include its endogenous synthesis in the skin via ultraviolet (UV) radiation and limited dietary intake, as only a few foods are rich in vitamin D. While animal-derived foods such as fish, liver, and eggs provide vitamin D3 (cholecalciferol), mushrooms offer a unique non-animal source of vitamin D2 (ergocalciferol), synthesized via the photochemical conversion of ergosterol upon exposure to UV light.

This study evaluated the efficacy of solar drying and artificial UVB irradiation in enhancing vitamin D2 concentrations in *Lentinula edodes* (shiitake mushrooms). Freshly sliced mushrooms were allocated into three experimental groups: (1) solar-dried under natural sunlight in July (a period of peak UV intensity in the Czech Republic), (2) exposed to a 25 W UVB 10.0 lamp for one hour prior to conventional drying, and (3) a control group subjected to drying without any intentional UV exposure. Quantification of vitamin D was conducted using High-Performance Liquid Chromatography (HPLC).

The UVB-treated samples exhibited the highest vitamin D2 concentration (1.92 ± 0.03 μg/g), followed by the solar-dried group (1.16 ± 0.07 μg/g) and the untreated control (0.66 ± 0.07 μg/g). These results demonstrate that both solar and artificial UVB exposure significantly enhance vitamin D2 synthesis in shiitake mushrooms, with artificial UVB irradiation proving more effective. Given the Recommended Dietary Allowance (RDA) of 15 μg/day for vitamin D, a modest serving of UV-treated mushrooms could substantially contribute to daily intake requirements.

Furthermore, mushrooms represent a nutritionally valuable, fast-growing, and sustainable food source that can be cultivated on lignocellulosic agricultural by-products such as sawdust. Their adaptability to small-scale and urban farming systems underscores their potential role in addressing micronutrient deficiencies while supporting environmentally resilient food production strategies.

Keywords: Ergocalciferol, functional foods, lentinula edodes, mushroom postharvest processing, solar drying, sustainable food systems, UV irradiation, vitamin D

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