**Tropentag, September 11-13, 2024, hybrid conference**

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# Impact of environmental stress on bioactive compounds in shiitake mushrooms

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## Abstract

Shiitake (*Lentinula edodes*), a very popular edible mushroom from East Asia is appreciated due to its nutritional value, rich aroma, specific taste, and its beneficial effects on human health. Despite numerous shiitake-focused studies are exploring differences in the biochemical composition according to strains or substrates they grow on, there is a notable absence of scientific literature addressing the influence of environmental conditions and if so, research emphasises correlations with yield, neglecting the broader implications on bioactive compound production.

Harsh environmental conditions influence the production of diverse bioactive compounds and also induce creation of so-called secondary metabolites which help mushrooms to adapt and survive in changing ambient conditions. These compounds not only enhance mushroom resilience but they also have nutritional, organoleptic, or medicinal value for humans. Key secondary metabolites in shiitake include polyacetylenes (having antimicrobial activities), sulfurous compounds (responsible for specific shiitake aroma), lovastatin (lowering blood cholesterol and preventing cardiovascular diseases), eritadenine (cholesterol-reducing compound), or ergosterol (precursor of vitamin D2).

In this study blocks of the substrate with shiitake mushrooms were cultivated in laboratory conditions. Some blocks were subjected to abiotic environmental stresses – heat, cold, and drought – in a controlled climate chamber. Harvested mushrooms were dried and ground. The headspace solid-phase microextraction gas chromatography mass spectrometry (HS-SPME-GC-MS) was used to analyse volatile compounds. Several compounds, including carbon disulfide, 3-octanone, hexanal, 1,2,4-Trithiolane, and others, were analyzed. Significant differences were observed in the levels of carbon disulfide, while hexanal showed minimal variation. Also, the amount of ergosterol in treated samples was examined.

This study contributes to better understanding of how environmental factors influence the biochemistry of shiitake mushrooms and may help with optimising of cultivation conditions in order to maximise the production of desirable compounds improving its sensory and nutritional properties. Moreover, increased presence of ergosterol has a great potential for improving not only vegans and vegetarians diets, where vitamin D supplementation is needed due to its scarcity in plant-based foods.

**Keywords:** Environmental stress, *Lentinula edodes*, secondary metabolites, volatile compounds

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