

Investigating the impact of light on the growth and tryptamine content of *Psilocybe cubensis* mushrooms



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ABSTRACT

Psilocybin and its dephosphorylated counterpart, psilocin, are tryptamine secondary metabolites found in magic mushrooms, particularly of the *Psilocybe* genus. The use of mushrooms dates back to pre-Colombian Mesoamerican societies within spiritual and mystical rituals. Synthetic versions of the compounds are gaining popularity as potential therapeutics in treating various neurological disorders, with the emergence of clinical evidence. Psilocybin has found application in the clinical setting in the treatment of cluster headaches, anxiety and depression. Given the increasing interest in the therapeutic application of psilocybin and psilocin, there is an increased demand for these compounds, as well as the need for basic scientific understandings of their expressions and biosynthesis within fungi. This study was designed to determine the growth condition which facilitates increased production of natural psilocybin and psilocin in the most popularly grown mushroom species in the tropics, *Psilocybe cubensis*. Mushroom fruiting bodies in this study were cultivated under conditions varying light exposure periods. Fruits were allowed to develop in complete 24 h dark, 12 h light/12 h dark or 24 h light conditions. Results from this study revealed that fruits harvested from the 24 h dark condition were both physically and chemically distinct. These fruits contained significantly higher total psilocin and psilocybin (tryptamine) content than those grown in normal ($p=0.0174$) conditions. They also showed longer stems contributing to a greater percentage of the overall weight of the mushrooms as well as their tryptamine content. The growing conditions for cultivating mushrooms with increased psilocybin and psilocin content will be highlighted.

OBJECTIVES

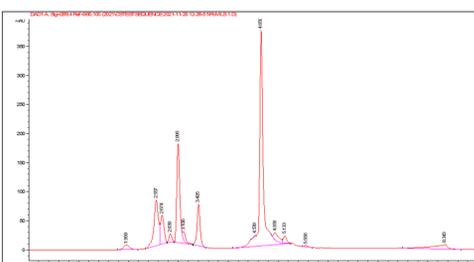
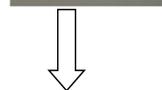
To determine the influence of light on the growth and tryptamine content of *Psilocybe cubensis* Malabar cultivated on Horse manure.

METHODS

Psilocybe cubensis Malabar grown on popcorn grains was spawned on pasteurized horse manure after full colonization and incubated at $25 \pm 2^\circ\text{C}$ under 3 different lighting conditions.

Mature mushrooms were harvested, weighed, counted and measured prior to drying in an oven at 40°C for 24h.

Analysis of tryptamine content was then carried out via HPLC.



RESULTS

NORMAL 12h L/D LIGHT DARK



Figure 1. Appearance of representative fruits of *Psilocybe cubensis* Malabar harvested following exposure to different light conditions during cultivation.

Impact of Light on Tryptamine content in whole mushrooms

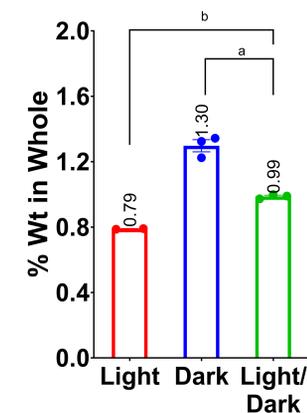


Figure 2. Effect of Light on the sum of psilocybin and psilocin (tryptamine content) in *Psilocybe cubensis* Malabar. Mushrooms grown in dark possessed significantly higher tryptamine content than those grown in normal ($p=0.0174$) conditions while mushrooms grown in 24 h light conditions ($p=0.0280$) possessed significantly lower tryptamine content than those grown in normal conditions.

Impact of Light on Growth

Growing conditions	Total number of mushrooms	Total wet weight (g)	Stem length (cm)	% Weight of stem in whole
NORMAL 12hr light/12hr dark	78	419.3	5 - 13	56.0
LIGHT	67	471.0	3 - 8	51.2
DARK	35	483.6	7 - 20	63.0

Impact of Light on Tryptamine content in stem compared to cap of mushrooms

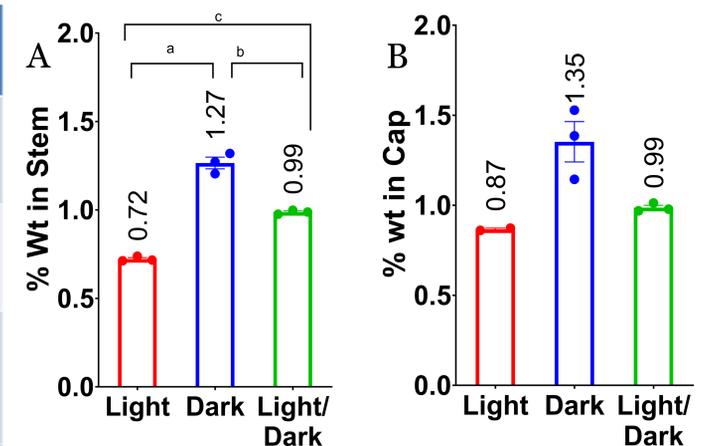


Figure 3. Effect of light on the sum of psilocybin and psilocin (tryptamine content) in (A) stem and (B) cap of *Psilocybe cubensis* Malabar cultivated under different light conditions. The stems of the mushroom cultivated in the dark ($p=0.0229$) possessed significantly higher tryptamine content than those obtained from normal conditions while stems obtained from light conditions ($p=0.0048$) possessed significantly lower tryptamine content than those grown in normal conditions. Tryptamine content in the caps of mushrooms cultivated in the light ($p=0.0931$) or dark ($p=0.1041$) did not differ significantly from those grown in normal conditions.

CONCLUSION

Fruits harvested from the 24 h dark growing condition were both physically and chemically distinct from 12 h light/12 h dark and 24 h light conditions. These fruits contained significantly higher tryptamine content than those grown in normal conditions. They also showed longer stems contributing to a greater percentage of the overall weight of the mushrooms as well as their total psilocin and psilocybin content.

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