Exploring Basidiomycota for sustainable food colour production

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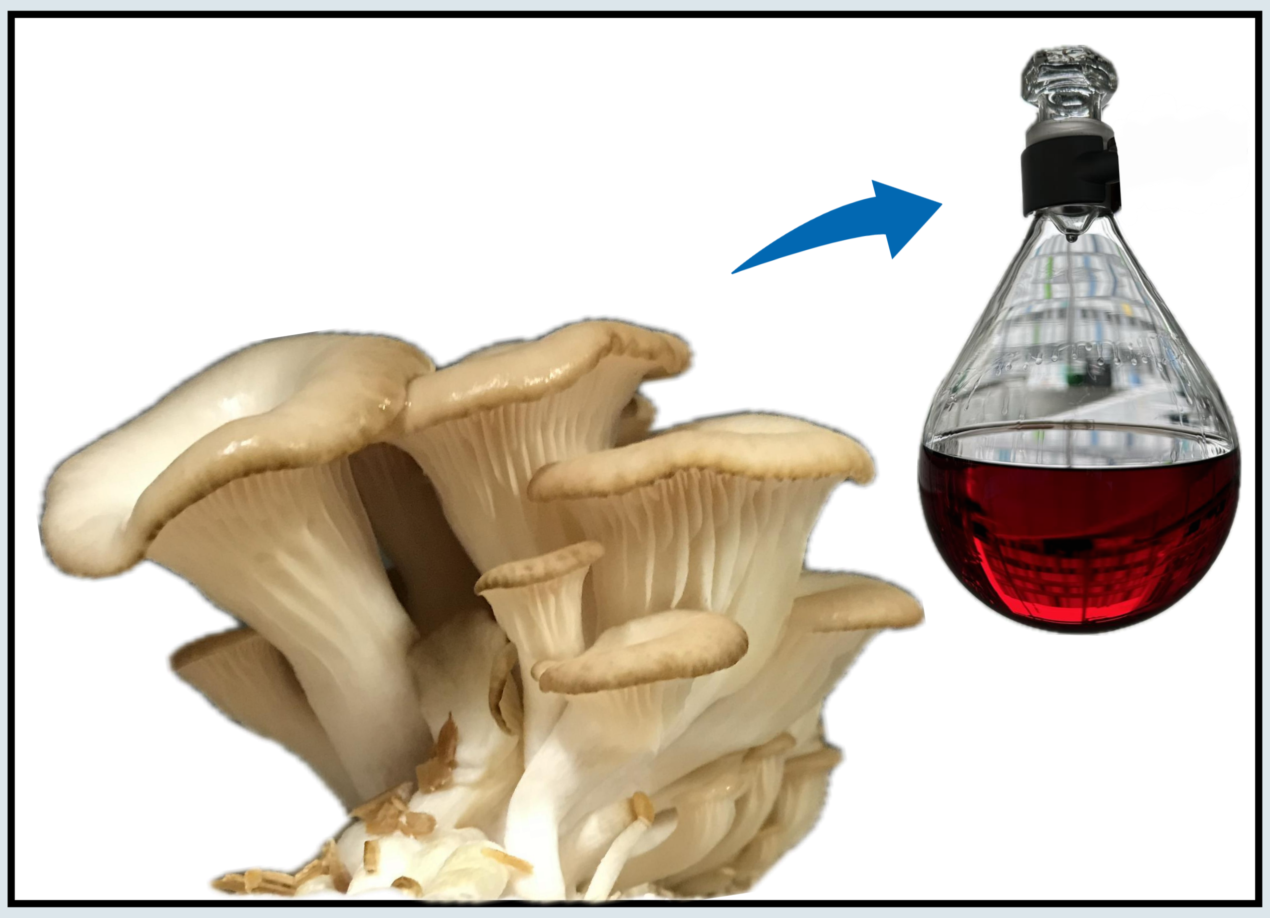
Introduction

Industry is facing increasing public demand for new natural colourants as consumers seek "clean labeled" products [1]. However, natural alternatives often exhibit low stability and/or limited water solubility, which hinders their use in food applications. Nevertheless, some fungal dyes outperform synthetic ones in terms of sustainability, biodegradability, and beneficial bioactivity, while offering several advantages over plant- or animal-based dyes: they are vegan, their production is not seasonal, and they do not require arable land, pesticides, or fertilisers. Furthermore, fungi offer a great biodiversity of structures and hues, allowing customized products. The development of fungal-based pigments relies on suitable strains that provide (I) profitable yields, (II) pigment purity and stability, and (III) the absence of toxic compounds [2]. A variety of strains from the phylum Basidiomycota were screened for the production of red colourants, and the results are shown below.



Methods & Results

500

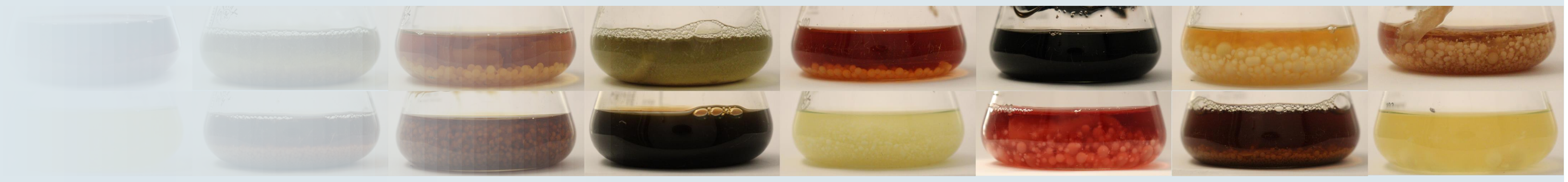
53
Candidates selected for surface screening

22
Submerged screening with high performers

9
Optimised

3
Finalists

The strain collection of the Institute of Food Chemistry and Food Biotechnology, JLU



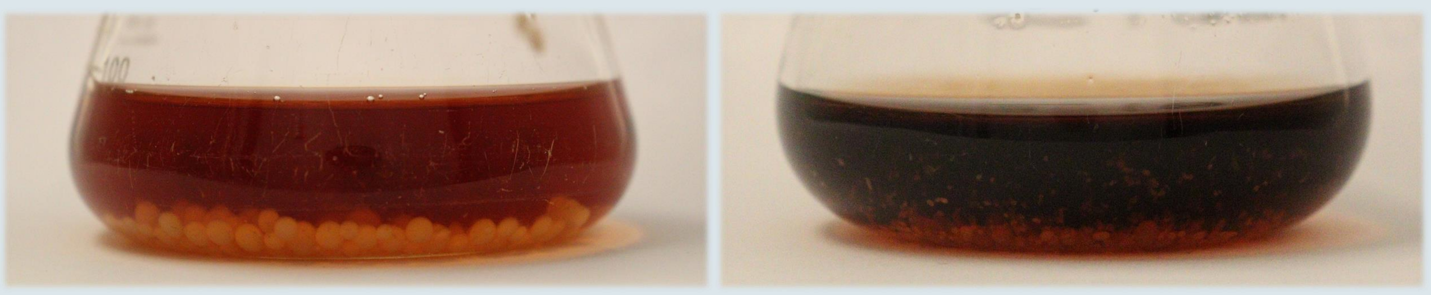
ECP

Day 8 | Day 10 | Day 12

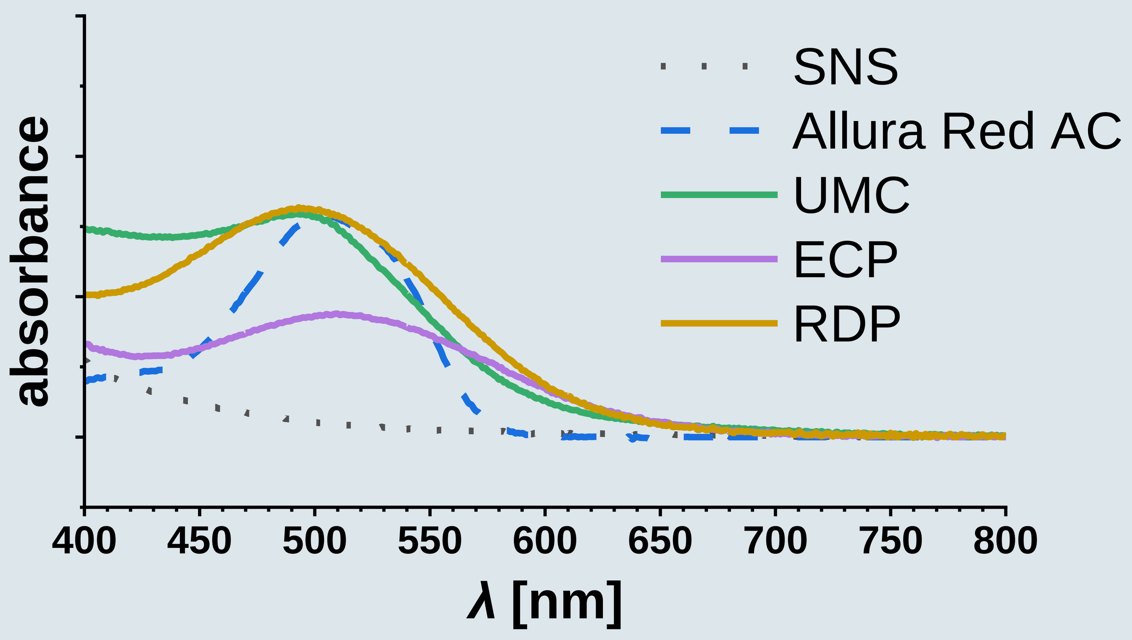
RDP

24 °C | 30 °C

UMC



SNS | SNS + amino acid



SNS 1x 2x

pH 9 8 7 6 5 4 3 2

SNS = used reference media

Conclusion

Until now, most dyes derived from Basidiomycota have been primarily described in the fruiting bodies [3]. This study demonstrates the spectrum of colours achievable through the more efficient method of submerged cultivation. By optimizing parameters such as temperature and supplementing appropriately with different amino acids, the strains ECP, RDP, and UMC have the potential to produce remarkably stable and visually appealing red hues. However, more work has to be done to leap these biocolours into industrial applications.

[1] Dufossé L, Caro Y, Fouillaud M. Fungal Pigments: Deep into the Rainbow of Colorful Fungi. J Fungi, 2017.
[2] Lebeau J, Venkatachalam M, Fouillaud M, Petit T, Vinale F, Dufossé L, Caro Y. Production and New Extraction Method of Polyketide Red Pigments Produced by Ascomycetous Fungi from Terrestrial and Marine Habitats. J Fungi, 2017.
[3] Velisek, Jan & Cejpek, Karel. Pigments of Higher Fungi: A Review. Czech Journal of Food Sciences, 2011.

Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag
FEI Forschungskreis der Ernährungsindustrie e.V.
AiF Forschungsnetzwerk Mittelstand
iGF Industrielle Gemeinschaftsforschung
GNT
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