

ALTERNATIVE STRATEGY FOR PIGMENTS PRODUCTION USING SOLID-STATE FERMENTATION AND CHEESE WHEY

Agricultural, Marine and Food Biotechnology

PO - (749) - ALTERNATIVE STRATEGY FOR PIGMENTS PRODUCTION USING SOLID-STATE FERMENTATION AND CHEESE WHEY

Basto, Bruna (Portugal)^{1,2}; Silva, Nuno R. Da (Germany)³; Silvério, Sara C. (Portugal)^{1,2}; Teixeira, José A. (Portugal)^{1,2}

1 - CEB-Centre of Biological Engineering; 2 - LABBELS—Associate Laboratory; 3 - DWI-Leibniz Institute for Interactive Materials

Body

Natural pigments have several industrial applications, namely in the textile industry for dyeing cloths, or in the food industry, as coloring agents. Pigments can also be used in cosmetics, leather or in the pharmaceutical industry. More recently, other applications were found for pigments like in histological staining, in solar cells or as pH indicators [1]. Microbial production of natural pigments has been considered a promising alternative to synthetic pigments. Filamentous fungi are known to produce many different pigments. Recently, some *Penicillium* species, such as *P. chrysogenum* and *P. purpurogenum*, were described as effective pigment producers. Solid-state fermentation (SSF) has gained attention and is preferred for fungi cultivation due to better yields and easier and less expensive product recovery [2].

Preliminary results indicated that pigment production was favored when lactose was used as carbon source under submerged fermentation (SmF). Since CW, a by-product from cheese industry, contains high lactose content, it was used as an inexpensive alternative fermentation medium to induce the pigment production.

In this work, the production of pigments by *Penicillium sp.* was evaluated under SSF conditions using an inert support and the results obtained were compared with those obtained under SmF conditions. The studied culture media comprised a synthetic medium [3] and alternative media containing cheese whey (CW).

A mixture of three pigments (yellow, orange and red with λ_{max} =400, 470 and 500 nm, respectively) was obtained. To evaluate the best conditions for pigments production, the sum of absorbances was determined and the synthetic medium under SmF conditions was used as reference medium to calculate the relative absorbance. After 12 days of fermentation, the synthetic medium presented the highest pigment production (**Figure 1**) for both SmF and SSF conditions. The supplementation of CW with yeast extract and peptone considerably improved the production of pigments under SmF conditions. On the other hand, under SSF conditions an increase in supplementation was followed by a decrease in pigments production.

These results suggest that SSF combined with a more concentrated CW medium can be a promising strategy to improve pigment production using a less expensive fermentation condition and alternative media totally composed of an industrial by-product.

Acknowledgements

This study was supported by the Portuguese Foundation for Science and Technology (FCT) under the scope of the strategic funding of UIDB/04469/2020 unit and BioTecNorte operation (NORTE-01-0145-FEDER-000004) funded by the European Regional Development Fund under the scope of Norte2020 - Programa Operacional Regional do Norte.

References

[1] Fungal and bacterial pigments: Secondary metabolites with wide applications, Narsing Rao MP, Xiao M, Li WJ, *Frontiers in Microbiology*, 8, 1113 (2017).

[2] Monascorubin production by *Penicillium minioluteum* ED24 in a solid-state fermentation using sesame seed cake as substrate, Zahan KA, Ismail NS, Leong CR, Rashid SA, Tong WY, *Materials Today: Proceedings*, *In Press* (2020)

ALTERNATIVE STRATEGY FOR PIGMENTS PRODUCTION USING SOLID-STATE FERMENTATION AND CHEESE WHEY

[3] Carbon source regulation of β -galactosidase biosynthesis in *Penicillium chrysogenum*, Nagy Z, Keresztessy Z, Szentirmai A, Biró S, Journal of Basic Microbiology, 41, 351-362 (2001)

Image Legends

Figure 1. Relative absorbance (%) obtained using synthetic medium (A), cheese whey (B), cheese whey supplemented with 0.5 g/L yeast extract and peptone (C) and cheese whey supplemented with 4 g/L of yeast extract and peptone (D) under submerged (SmF) and solid-state fermentation (SSF).

Palavras-chave : Cheese whey, Solid-state fermentation, Filamentous fungi, Pigments

