

Characterization of a water soluble blue pigment from *Arthrobacter* sp. 34LCH1

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Abstract

Currently the obtaining natural pigments from microorganisms is of interest because they can potentially be used as natural dyes in the food, cosmetics, and textile industries.

In this study, a blue pigment producing bacteria was isolated and identified, and its chemical properties were characterized after being purified. The bacterial strain was isolated from a sample of water from Lake Chungará (Chile) for its ability to produce pigment around the colony. Taxonomic identification was based on the sequencing of the 16S rRNA gene. Pigment extraction was performed from a 24 h culture in TYES broth (25°C/150rpm), which was tangentially filtered to obtain a free cell solution. The pigment present in the solution was purified by column chromatography/solid phase extraction in the following resins sequentially: Amberlite XAD, anionic (QMA), C-18, anionic, size exclusion, and finally C-18. The resulting solution was rotary evaporated and crystallized with ethanol. Then, the pigment was analysed by reverse phase (C-18) HPLC-DAD.

The strain was identified as *Arthrobacter* sp (99% similarity). Crude pigment production reached 1 g L⁻¹ of culture. The pigment corresponds to a hygroscopic solid of ionic character, very soluble in water, partially soluble in methanol, and insoluble in the other organic solvents. The pigment is more stable between pH 6 and 10 and at temperatures below 60°C. HPLC analysis shows that crude pigment is composed of four major blue compounds with $\text{tr min}^{-1} (\lambda_{\text{max}} \text{ nm}^{-1}) = 22.06 (603), 22.47 (593), 22.94 (596) \text{ and } 23.45 (590)$, and at least four other minor colored compounds. The physicochemical properties and microorganism genus suggest that the compounds belong to the family of azaquinones, chemically related to the bacterial pigment indochrome and amylocyanin. The mentioned pigments were not studied in terms of toxicity or possible applications, which is our future work.

Image



Figure 1: *Arthrobacter* sp. 34LCH1 colonies on TYES media. It can be seen the blue, water soluble, diffusible pigment.

Recent Publications

1. Fujikawa, H., & Akimoto, R. (2011). New Blue Pigment Produced by *Pantoea agglomerans* and Its Production Characteristics at Various Temperatures. *Applied and Environmental Microbiology*, 77(1), 172–178.
2. Sutthiwong, N., Fouillaud, M., Valla, A., Caro, Y., Dufossé, L. (2014). Bacteria belonging to the extremely versatile genus *Arthrobacter* as novel source of natural pigments with extended hue range. *Food Research International* 65, 156–162.
3. Knackmuss, H.-J., Cosens, G., and Star, M.P. (1969). The Soluble Blue Pigment, Indochrome, of *Arthrobacter polychromogenes*. *European J. Biochem.* 10, 90-95.
4. Venil, C.K., Zakaria, Z.A., & Ahmad, W.A. (2013). Bacterial pigments and their applications. *Process Biochemistry*, 48(7), 1065-1079.
5. Habermehl, V., Christ, B.G..(1977) Amylocyanin, the Blue Pigment of *Streptomyces coelicolor*. *Naturwissenschaften*. 64(2):97-8.

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