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Spectroscopic insights into prodigiosin pigment production by *Serratia marcescens*

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The appearance of cheese can be influenced by the intentional use of dyes such as paprika that color its rind, particularly in smear-ripened cheeses. In addition to this intentional addition, some microorganisms naturally present in cheeses can produce pigments that lead to color defects that negatively impact consumer acceptance and economic profitability. *Serratia marcescens* can produce a red pigment known as prodigiosin (Di Salvo, 2023). Prodigiosin is the most prominent secondary metabolite in the group of prodiginin compounds, with cycloprodigiosine, metacycloprodigiosine, undecylprodigiosin, prodigiosin R1, and streptorubin B (Stankovic *et al*., 2014). It was evaluated the prodigiosin production in two bacterial cultures *Serratia marcescens* ESACB 596 and *Serratia marcescens* ESACB 734, sourced from the Microbial Culture Collection of the Microbiology Laboratory of Polytechnic Institute of Castelo Branco, Portugal, with the aim to determine the optimal conditions to produce pink pigment. To achieve this, experiments were performed in three culture media (Luria Broth (LB), Nutritive Broth (NB) and Peptone Glycerol Phosphate (PGP), at two pH levels (7.5 and 8.0) and two different temperatures (22 °C and 28 °C).

It was observed that, under the conditions studied, the highest production of prodigiosin was reached by *S. marcescens* ESACB 734, in LB culture medium, with pH 8 at 22 °C after 48h of incubation. Antimicrobial tests revealed larger inhibition zones for prodigiosin compared to chloramphenicol against bacteria (*Pseudomonas aeruginosa* ATCC 27853 and *Pseudomonas fluorescens* ESACB 137) and compared to natamycin against fungi (*Candida zeylanoides* ESACB 7). Regarding the chemical characterization of the pigment, it was possible to identify peaks through the FTIR-ART and FT-RAMAN spectra however it was through the FT-RAMAN spectrum (Figure 1), that a complete characterization was obtained. The characterization of Prodigiosin using FT-RAMAN is scarcely described in the literature, making the present work a significant contribution in this area.

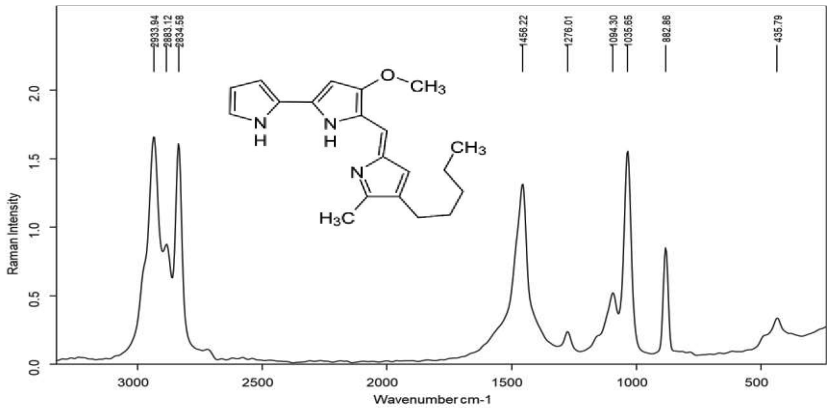

Figure 1: FT-RAMAN spectrum of the prodigiosin pigment produced by *Serratia marcescens* ESACB 734.

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