

*Supplementary Materials*

# Characterization and Biotechnological Potential of Intracellular Polyhydroxybutyrate by *Stigeoclonium* sp. B23 Using Cassava Peel as Carbon Source

Murilo Moraes Mourão <sup>1,\*</sup>, Luciana Pereira Xavier <sup>1</sup>, Ralph Urbatzka <sup>2</sup>, Lucas Barbosa Figueiroa <sup>3</sup>, Carlos Emmerson Ferreira da Costa <sup>3</sup>, Carmen Gilda Barroso Tavares Dias <sup>4</sup>, Maria Paula Cruz Schneider <sup>5</sup>, Vitor Vasconcelos <sup>2,6</sup> and Agenor Valadares Santos <sup>1,\*</sup>

<sup>1</sup> Laboratory of Biotechnology of Enzymes and Biotransformations, Institute of Biological Sciences, Federal University of Pará, 66075-110 Belém, Pará, Brazil; lpxavier@ufpa.br

<sup>2</sup> Interdisciplinary Center of Marine and Environmental Research—CIIMAR, University of Porto, 4450-208 Porto, Portugal; rurbatzka@ciimar.up.pt (R.U.); vmvascon@fc.up.pt (V.V.)

<sup>3</sup> Laboratory of Oils of the Amazon, Guamá Science and Technology Park, Federal University of Pará, 66075-750 Belém, Pará, Brazil; lucasfigueiroa57@gmail.com (L.B.F.); emmerson@ufpa.br (C.E.F.d.C.)

<sup>4</sup> Laboratory of Materials Processing, Institute of Technology, Federal University of Pará, 66075-110 Belém, Pará, Brazil; cgbtd@ufpa.br

<sup>5</sup> Genomics and Systems Biology Center, Federal University of Pará, 66075-110 Belém, Pará, Brazil; mariapaulacruzschneider@gmail.com

<sup>6</sup> Department of Biology, Faculty of Sciences, University of Porto, 4069-007 Porto, Portugal

\* Correspondence: mouraomurilo@gmail.com (M.M.M.); avsantos@ufpa.br (A.V.S.)

**Citation:** Mourão, M.M.; Xavier, L.P.; Urbatzka, R.; Figueiroa, L.B.; Costa, C.E.F.d.; Dias, C.G.B.T.; Schneider, M.P.C.; Vasconcelos, V.; Santos, A.V. Characterization and Biotechnological Potential of Intracellular Polyhydroxybutyrate by *Stigeoclonium* sp. B23 Using Cassava Peel as Carbon Source. *Polymers* **2021**, *13*, 687. <https://doi.org/10.3390/polym13050687>

Academic Editor: Łukasz Kłapiszewski

Received: 6 February 2021

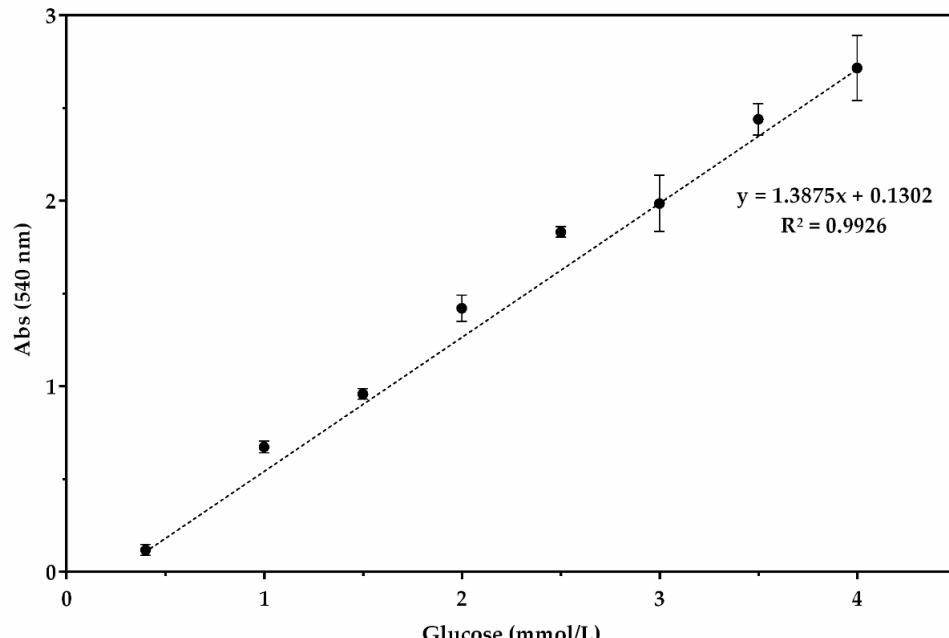
Accepted: 17 February 2021

Published: 25 February 2021

**Publisher's Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Copyright:** © 2021 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).



**Figure S1.** Standard curve of commercial glucose. UV absorbance 540 nm is plotted as a function of the amount of glucose in mmol/L. Data are the mean ± SD of three replicates.

**Table S1.** ANOVA Table of Calculated Parameter (BMP, PHB and P<sub>PHB</sub>) and Modified Z8 Media of *Stigeoclonium* sp. B23 at the 95% Confidence Level.

|                   | Degrees of Free-dom | Sum of Squares | Mean of Squares | F <sub>calc</sub> | p Value      |
|-------------------|---------------------|----------------|-----------------|-------------------|--------------|
| Interaction       | 4.0                 | 144.2          | 36.04           | 58.83             | $p < 0.0001$ |
| Yield parameters  | 2.0                 | 283.4          | 141.7           | 231.3             | $p < 0.0001$ |
| Modified Z8 media | 2.0                 | 58.07          | 29.03           | 47.39             | $p < 0.0001$ |
| Residual (error)  | 18.0                | 11.03          | 0.6126          |                   |              |
| Total             | 26.0                | 496.7          |                 |                   |              |

**Table S2.** Tukey's Post Hoc Multiple Comparisons of Calculated Parameters (BMP, PHB, and P<sub>PHB</sub>) and Modified Z8 Media of *Stigeoclonium* sp. B23. The Mean Difference is Significant at the 0.05 level.

| Treatment Comparisons                                 | Mean Difference | 95% Confidence Interval |             | p Value  |
|---|-----------------|-------------------------|-------------|----------|
|   |                 | Lower Bound             | Upper Bound |          |
| <b>BMP (g/L)</b>                                      |                 |                         |             |          |
| Z8/100%NaNO <sub>3</sub> vs. Z8/25%NaNO <sub>3</sub>  | 0.7273          | 0.8090                  | 1.536       | 0.5039   |
| Z8/100%NaNO <sub>3</sub> vs. Z8/2.5%NaNO <sub>3</sub> | 1.008           | 0.5282                  | 1.536       | 0.2805   |
| Z8/25%NaNO <sub>3</sub> vs. Z8/2.5%NaNO <sub>3</sub>  | 0.2808          | 0.5282                  | 0.8090      | 0.8996   |
| <b>PHB (%)</b>  |                 |                         |             |          |
| Z8/100%NaNO <sub>3</sub> vs. Z8/25%NaNO <sub>3</sub>  | -11.24          | 12.17                   | 0.9282      | < 0.0001 |
| Z8/100%NaNO <sub>3</sub> vs. Z8/2.5%NaNO <sub>3</sub> | -7.977          | 8.905                   | 0.9282      | < 0.0001 |
| Z8/25%NaNO <sub>3</sub> vs. Z8/2.5%NaNO <sub>3</sub>  | 3.263           | 8.905                   | 12.17       | < 0.0001 |
| <b>P<sub>PHB</sub> (g/L)</b>                          |                 |                         |             |          |
| Z8/100%NaNO <sub>3</sub> vs. Z8/25%NaNO <sub>3</sub>  | -0.08366        | 0.09792                 | 0.01426     | 0.9906   |
| Z8/100%NaNO <sub>3</sub> vs. Z8/2.5%NaNO <sub>3</sub> | -0.03202        | 0.04628                 | 0.01426     | 0.9986   |
| Z8/25%NaNO <sub>3</sub> vs. Z8/2.5%NaNO <sub>3</sub>  | 0.05164         | 0.04628                 | 0.09792     | 0.9964   |