

Enhancement of cell density and characterization of *Chlorella vulgaris* immobilized within beads for lipid production

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Abstract:

The success of microalgae immobilized in gel beads for lipid production heavily relies on the characteristics of the matrices employed. This study aims to determine cell density and characterize *Chlorella vulgaris* cells immobilized within beads using new combined matrices with volumetric ratios (Matrices:Microalgae) namely, (1) mixed matrices, SACMCCA (0.3:1) (2) SACA (0.3:1) (3) SACMC (1:1) and (4) SA (1:1) (sodium alginate, SA; calcium alginate, CA; sodium carboxymethyl cellulose, CMC) as a control experiment. The pore size, surface morphology, size of the beads, membrane thickness and chemical compound of these beads were examined. The cell density demonstrated that SACMCCA beads presented the highest value of $1.72 \pm 0.5 \times 10^9$ cells/mL and lipid yield (30.43 ± 0.30 %) compared to SACA (24.29 ± 0.50 %), SACMC (13.00 ± 0.60 %) and SA (6.71 ± 0.50 %). The immobilized SACMCCA beads had a rough surface with larger pores (32.78 ± 0.05 μm) and several characteristics which important for a successful immobilized properties compared to other beads. The characterization had provided important characteristics for a successful entrapment of *Chlorella vulgaris*. In addition, the combination of single matrices had improved the cell density and lipid production for future applications in the biofuel industry.

Keywords: Characterization; Cell Density; Immobilization; Lipid; Matrix; Microalgae.

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