Towards a More Sustainable Food Chain: Microbial Protein Production from Catalytically or Biologically Fixed CO_2

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Abstract: The rapidly growing protein demand poses risks to the food sector. At the same time the environmental impact of conventional agriculture is ever-increasing. Microbial protein (MP) has been proposed as a solution to these issues: it is nutrient-efficient, high-quality protein, that can be produced sustainably when considering wasted resources, such as nitrogen contained in wastewater and CO_2, as feedstock. Specifically, CO_2 can be converted into formate and/or acetate through physicochemical or biological processes. Such CO_2-sourced formate or acetate can circumvent mass transfer limitations caused by the direct use of gaseous CO_2. Experiments showed that formate and acetate can be used as carbon sources for growth of several pure and mixed cultures, producing MP. Specifically, we established key kinetic, stoichiometric as well as nutritional parameters, proving the feasibility of this concept. This approach can further decrease the environmental footprint of MP, paving the way for a more sustainable food chain.

Keywords: single cell protein; nutrient recovery; nutritional quality

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