

Growth-coupled and salt-stress independent production of sucrose from CO₂

CSIC has developed a procedure for capturing atmospheric CO₂ into sugars by constructing and using a recombinant *Synechococcus elongatus* strain. The novel strain is able to overproduce sucrose coupled to growth in the absence of any environmental stress. Furthermore, the strain is able to maintain a very high sucrose production rate for a long time while exceeding titers previously reported by engineered cyanobacteria. The organic sugar produced can be further used for feeding any biotechnological process in the context of autotrophic/heterotrophic microbial consortia.

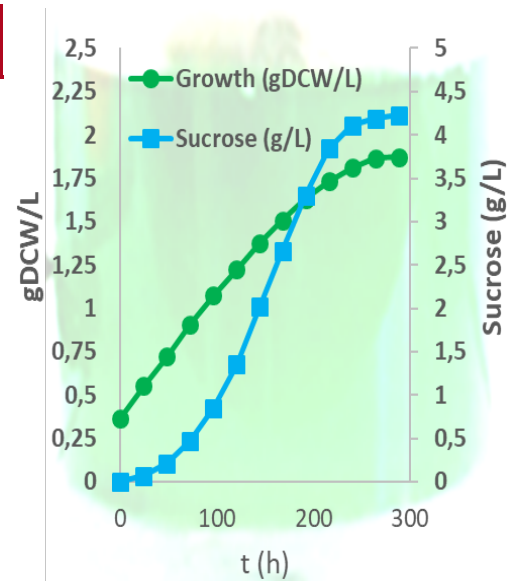
Industrial partners are being sought to collaborate through a patent licence agreement.

An offer for Patent Licensing

Setting the bases for a null CO₂ footprint sustainable bioprocess

Biotechnological approaches toward the establishment of biofactories as sustainable sources of energy and chemicals emerge as a real alternative for replacing fossil fuels. Cyanobacteria, due to its ability to use atmospheric CO₂ and sunlight as carbon and energy source are seen as promising players in the next generation of cell-factories. However, hampered by the low metabolic robustness of these organisms, the single use of cyanobacteria to provide the vast chemicals portfolio required nowadays have been questioned. As an interesting alternative, cyanobacteria could be used to produce organic carbon source feeding well-known microbial workhorses in the context of microbial consortia. However, current sucrose overproducer cyanobacteria require of osmotic stress to achieve this goal. In addition, the high salt concentration required largely compromise cell growth thus avoiding a continuous sucrose production process while limits the use of not halophilic heterotrophic bacteria as partners in biotechnological relevant microbial consortia.

By providing a cyanobacteria exhibiting a high sucrose production rate in the absence of any environmental stress, the present invention paves the way for the establishment of a new generation of cell-factories in the context of synthetic microbial consortia.



Growth-coupled secretion of sucrose by the recombinant *Synechococcus elongates* strain

Main innovations and advantages

- The production of sucrose by the engineered strain is independent of osmotic stress allowing a continuous process and higher bacterial biomass accumulation.
- The current strain exhibits a growth-coupled sucrose production, avoiding the need of classical two-phases bioprocess developed so far for sucrose production using cyanobacteria.
- The independence of high-salt conditions for sucrose production allows the use of the engineered cyanobacterium as sucrose overproducer in the context of microbial consortia providing organic carbon source to heterotrophic partners other than halophilic bacteria, including well-known cell factories such as *E. coli*, *P. putida* and *S. cerevisiae*, among others.

Patent Status

PCT patent application filed

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