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Sugar-secreting green microalga

A microalgae strain that secretes simple sugars in conditions favorable for co-culture schemes and fermentation processes.

IP Status: Provisional Patent Application Filed

Applications

- Simple sugar biosynthesis
- Fermentation glucose source
- Carbon sequestration by converting carbon dioxide to glucose

Key Benefits & Differentiators

- Broad range of pH; suitable for simple sugar synthesis at physiological pH
- Ideal for co-culture systems
- Simple sugar is secreted in its extracellular environment - better source of sugar for co-cultured microbes
- No need for extreme growth conditions such as pH and elevated salt or temperature

Alga for synthesizing simple sugar

Biomass fermentation processes represent an alternative avenue to produce fuels and commodity chemicals with reduced environmental impacts. Currently, land crops (corn, sugarcane, and sugar beets) are the main source of sugar-rich biomass for fermentations, but they require considerable cultivation time and post-harvest processing to extract and yield the monomeric sugars needed for downstream applications. Thus, feedstock costs represent a large portion of the total process costs, imposing minimum molar yields for commercial viability. The use of lignocellulosic biomass, electro-biotechnology approaches, and C1 feedstocks (CO, CO2 and CH4) have been proposed as potential solutions. Microalgae stand out for their ability to use C1 feedstocks, having a faster growth rate than land plants, and the availability of existing infrastructure for a variety of industrial applications.

Researchers at the University of Minnesota have developed methods of producing simple sugars using a microalgae strain, and a method of co-culture of the microalgae strain with other microbes to biosynthesize a product of interest using the sugars secreted by the microalgae strain. The recently isolated microalgae strain is found to secrete simple sugars into its extracellular environment under a broader range of pH than previously reported strains. Its high flexibility in pH, and ease of culture, enables co-culturing of a variety of microbes that can convert secreted simple sugars into other products such as ethanol. This method is also of interest for carbon sequestration by converting carbon dioxide to glucose.

This alga has the potential to decrease our reliance on conventional crops as a source of simple sugars. The ability to co-culture with other microbes opens new opportunities for reducing energy consumption, time, and wastage in biomanufacturing processes. This strain is more suitable for industrial applications, as many biosynthetic strategies are developed around a sugar feedstock; and, unlike this strain, most algae produce internal polysaccharides (starch) or complex carbohydrates in the extracellular space, which are not suitable for co-culturing

Technology ID

2021-306

Category

Engineering & Physical Sciences/Processes
Life Sciences/Biomaterials
Life Sciences/Industrial Biotech
Agriculture & Veterinary/Ag Biotechnology
Agriculture & Veterinary/Food Science & Nutrition

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systems.

Phase of Development

TRL: 3-4

The isolated alga strain has been sequenced and its sugar synthesis and suitability for co-culturing has been characterized.

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

Researchers

- **Brett Barney, PhD** Associate Professor, Bioproducts and Biosystems Engineering

References

1. McLaughlin, E. M., and B. M. Barney. , "Genomic analysis and characterization of Scenedesmus glucoliberatum PABB004: an unconventional sugar-secreting green alga.", https://doi.org/10.1111/jam.15311