Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

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Photosynthetic Production of Methyl Laurate

Laurate and methyl laurate are valuable compounds that are used in a wide range of sectors including personal care, food, fuel, adhesives, lubricants, paints and more. Methyl laurate is primarily derived from coconut and palm kernel oil; however, plantations that supply this oil do so at the cost of deforestation and animal habitat destruction as well as other forms of environmental degradation. A shift toward alternative and renewable sources is needed in the US and around the world. Photosynthetic microorganisms, such as cyanobacteria, are one such potential source. These microorganisms have been extensively studied and different pathways genetically altered to produce a variety of useful products and alternative sources of energy.

Researchers at Arizona State University have developed novel genetically modified cyanobacterial strains that produce and excrete methyl laurate using sunlight and CO2. Methyl laurate can be used as a biofuel and is a valuable product in many other sectors. A couple of factors contribute greatly to increased methyl laurate production - genetic engineering of the fatty acid biosynthesis pathway to boost metabolic flux, and reducing the production of exopolysaccharides, which increases the amount of fixed carbon available for methyl laurate production as well as reduces the amount of nutrients available for invasive microbes. As methyl laurate is not readily consumed by heterotrophs present in the culture, higher yields can be obtained. Harvesting is easy as methyl laurate readily separates from the aqueous phase and can be scooped off or harvested in an organic phase.

These novel strains provide a viable and promising alternative for methyl laurate production, which is environmentally preferable and may become economically feasible.

Potential Applications

- Photosynthetic production of methyl laurate

o Biofuels and lubricants

o Derivatives used in the food and chemical industries such as personal care products, cosmetics, detergents, surfactants, solvents, adhesives, paint, etc.

Benefits and Advantages

- Greater methyl laurate production – increased by 25% (20 mg/L/day)
- Could reduce the reliance on destructive plantation-based sources
- Increased amount of fixed carbon available for biofuel production
- Reduced carbon nutrients in the medium to decrease invasive microbes
- Scalable with limited processing needs

o Methyl laurate is biologically stable and suitable for large scale production

- Easy harvesting – methyl laurate separates from the aqueous phase and can be scooped off or harvested in an organic phase

For more information about this opportunity, please see

Final Technical Report - 2019

Presentation - 2019

For more information about the inventor(s) and their research, please see

Dr. Vermaas' departmental webpage

Dr. Vermaas' Institute webpage