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OPTIMIZATION OF ETHYLENE BIOPRODUCTION IN *SYNECHOCYSTIS* SP. PCC 6803

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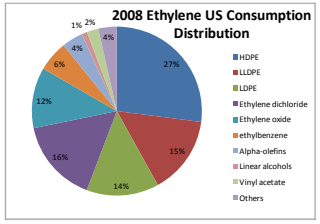
GOAL

To optimize key nutrient concentrations contributing to the greatest photosynthetic ethylene production in the cyanobacterium *Synechocystis* 6803.

BACKGROUND

Ethylene is the most produced petrochemical feedstock. Derived products include:

- plastics, including polyethylene, polystyrene and PVC, and textiles (polyester)
- long-chain hydrocarbons (e.g., diesel fuel) via polymerization
- High-grade ethanol through hydration

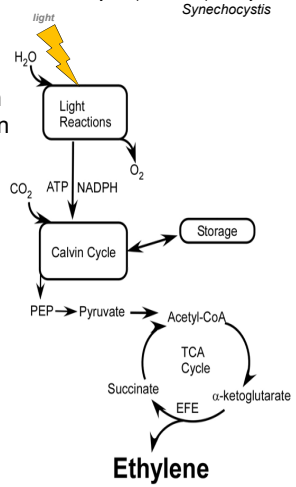


The current method of producing ethylene, steam cracking of petroleum feedstock, is the largest CO_2 emitting process in chemical industry. Globally, 133M tons produced in 2008 [4].

APPROACH

Expressed the ethylene-forming enzyme (*efe)* from *Pseudomonas syrangiae* in the cyanobacterium *Synechocystis* sp. PCC 6803

Ethylene production pathway in *Synechocystis*



PREVIOUS WORK

Studies showed that ethylene production was limited due to unknown media components becoming limiting.

METHODS

- Increased or decrease specific components 5-fold
- Measured rate of ethylene production using gas chromatography
- Optimization procedure: Data were fit to a second order polynomial

RESULTS

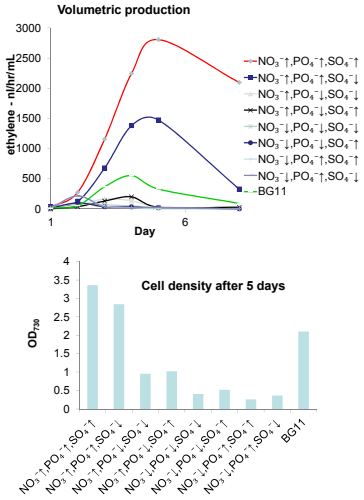


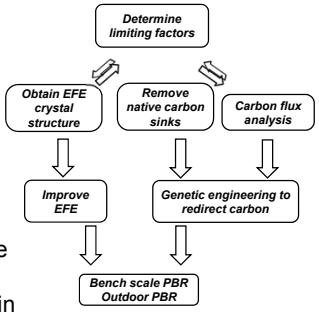
Figure 1. Describe graphs

CONCLUSIONS

- Increasing N, P, and S allow for increase ethylene and biomass production.
- Reduction of any single nutrient attenuates growth. Nitrogen is essential for ethylene production.
- General growth of *Synechocystis* and ethylene production are linked.

FUTURE DIRECTIONS

- Increase *efe* expression by incorporating additional copies of *efe.*
- Explore EFE protein structure, e.g., crystalize protein.
- Develop a more detailed understanding for the carbon-flux for ethylene production in *Synechocystis.*



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