Project aims to use probiotic bacteria to protect algal crops and increase ecosystem resilience

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This photograph of the rotifer Euchlanis shows all the internal organs. Rotifers are multicelled animals, with very few cells, less than 1,000. Lawrence Livermore researchers are working on research that would prevent rotifers from eating algal crops. Credit: Microscopy UK.

A Lawrence Livermore team has received an additional $1 million to

protect algal crops by developing "probiotic" bacteria to combat pond infestation and increase ecosystem function and resilience.

Algal biomass can be converted to advanced biofuels that offer promising alternatives to petroleum-based diesel and jet fuels. Additionally, algae can be used to make a range of other valuable bioproducts, such as industrial chemicals, biobased polymers and proteins.

Annual productivity is a key metric for algal biofuel production that, if optimized, could significantly decrease and stabilize biofuel price per gallon. Since grazers can result in a 30 percent loss in annual biomass productivity, a consistent mechanism for preventing predators will increase productivity and in turn decrease biofuel cost per gallon.

"We are only just beginning to understand that the pond microbiome is not only an indicator of health but also a tool for crop protection," said Rhona Stuart, one of the team members from LLNL.

The goal of the project is to identify and employ "probiotic" bacteria to increase microalgal survival by two-fold when under attack by rotifers or chytrids in mass algal cultures.

Rotifers and chytrids are common culprits of algae grazing. By using probiotic bacteria to increase algal resistance against these grazers, the team estimates at minimum a 5 percent to 10 percent increase in annual productivity. The proposed tool has several advantages over the baseline, including minimal risk of pest evolution, tailored microbiome diversity to increase ecosystem resilience and productivity, and probiotics that can increase algal productivity and outgrow pests.

The proposed work also will contribute to overcoming the barrier that exists in translating laboratory success to open pond success by

developing methodologies for translating microbiome work from bench scale to process development.

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