Algae: Biofuel of the future?

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University of Virginia researchers have a plan to greatly increase algae oil yields by feeding the algae extra carbon dioxide (the main greenhouse gas) and organic material like sewage, meaning the algae could simultaneously produce biofuel and clean up environmental problems.

In the world of alternative fuels, there may be nothing greener than pond scum.

Algae are tiny biological factories that use photosynthesis to transform carbon dioxide and sunlight into energy so efficiently that they can double their weight several times a day, producing oil in the process — 30 times more oil per acre than soybeans, according to the U.S. Department of Energy. Like soybean oil, the algae oil can be burned directly in diesel engines or further refined into biodiesel.

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"We have to prove these two things to show that we really are getting a free lunch," said Lisa Colosi, a U.Va. professor of civil and environmental engineering who is part of the interdisciplinary research team.

Most previous and current research on algae biofuel, explained Colosi, has used the algae in a manner similar to its natural state — essentially

letting it grow in water with just the naturally occurring inputs of atmospheric carbon dioxide and sunlight. This approach results in a rather low yield of oil — about 1 percent by weight of the algae.

The U.Va. team hypothesizes that feeding the algae more carbon dioxide and organic material could boost the oil yield to as much as 40 percent by weight, Colosi said.

Proving that the algae can thrive with increased inputs of either carbon dioxide or untreated sewage solids will confirm its industrial ecology possibilities — to help with wastewater treatment, where dealing with solids is one of the most expensive challenges, or to reduce emissions of carbon dioxide, such as coal power-plant flue gas, which contains about 10 to 30 times as much carbon dioxide as normal air.

Research partner Mark White, a U.Va. finance professor, will be quantifying the big-picture environmental and economic benefits of algae biofuel compared to soy-based biodiesel under several hypothetical scenarios. For instance, if the nation instituted a carbon cap-and-trade system, that would increase the monetary value of algae's ability to dispose of carbon dioxide. Increased nitrogen regulations would also bump up the appeal of algae, since it can also remove nitrogen from air or water.

"The main principle of industrial ecology is to try and use our waste products to produce something of value," Colosi said.

This research will quantify just how much "free lunch" algae biofuel promises.

Source: University of Virginia