Montana researchers to study algae as a source of biofuel

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Recently, the U.S. Department of Energy awarded Montana State University and Utah State University a three-year, $900,000 grant to study the oil produced by algae, which could be a renewable source of biodiesel.

The two universities will split the money more or less down the middle, said Brent Peyton, a professor of chemical and biological engineering at MSU and the principal investigator of the grant.

"It's been known for 20 years that algae could produce lipids, but it really took the most recent spike in fuel prices to make getting fuel from algae an option," Peyton said.

Almost all algae contain some oil, but the algae that Peyton and his fellow researchers are interested in are 30 to 50 percent oil by weight. This oil can be harvested and converted into biofuels in much the same way oil is harvested from crops like camelina and canola.

The MSU and Utah State project will screen different kinds of algae to learn which species produce the most oil and which can produce those oils most efficiently. The test algae will come from existing stocks at labs across the country and from field sampling, Peyton said.

Once the researchers find a candidate species, they will grow large numbers of the algae in a "raceway" bioreactor at Utah State. This 10,000-gallon, climate-controlled water tank has machinery that keeps

the algae gently moving so that they can grow more efficiently.

One of Peyton's collaborators, retired MSU microbiologist Keith Cooksey, was a pioneer in algal oil biofuel research in the early 1980s. However, funding for the research dried up by the end of the decade, halting algal biofuel work until the recent spike in oil prices caused interest to pick up again last year.

"Although biofuel research with algae hasn't moved much in the last 20 years, molecular work with algae has made some significant advances," Cooksey said, nothing that those advances will help today's researchers move ahead more quickly than scientists did in the 1980s. For example, MSU microbiologist and project collaborator Matthew Fields will use modern molecular biology and genomics to learn how to make algae produce more oil.

Researching algae is a bit of a departure for Peyton, whose background is in using microorganisms to clean up environmental contamination. But he said it would be a constructive departure.

"I wanted to use natural organisms not just to break something down but to produce something," said Peyton, who earned his doctorate at MSU in 1992. "This work is an opportunity to use my bioprocessing skills to produce something of value to society."

Ideally, algae harvesting is a self-sustaining process, Peyton said, since the tiny organisms spend most of their time just soaking up sunlight and reproducing.

Algae can produce more usable oil per acre than crops like canola or soybeans, Peyton said. Soybeans produce about 50 gallons of oil per acre per year; an acre of canola produces about 130 gallons per year. Algae, however, could produce at least 4,000 gallons of oil per acre in the same

time.

"Algae should produce about 200 times more biodiesel per acre than other biofuel crops," Peyton said. "And 200 may be a low number."

Algae also have benefits that make farming them easier on growers, Peyton said. Algae farms can be located on non-prime agricultural land and can use water not suitable for food crops.

"Algae, unlike some other biofuel crops, don't double as food, which means that harvesting them for biofuel production won't affect food prices like it would if we diverted part of the corn crop to biofuel," Peyton said.

One issue holding algal biofuel farming back so far has been scale, Peyton said. It's one thing to grow algae in a four-gallon or even a 10,000-gallon tank; it's another thing to expand that operation up to the industrial scale and turn it into a business.

Algae are living things, not just raw material, Peyton said, so finding the best species of algae to use and the best practices by which to make them produce oil for biodiesel will be an important part of the research.

Pulling together biomass science like this, which could one day result in a new farming and fuel industry, is not the kind of work that can be done by just microbiologists or just engineers, Peyton said. It requires working across departmental borders.

"MSU is unique for its strong collaborations between environmental microbiologists and chemical and biological engineers," he said. "There aren't a lot of universities in the country that pull all of that together as well as MSU does."

Source: Montana State University