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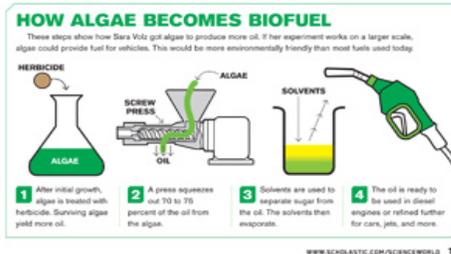
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OIL BLOOM A Colorado high school student's breakthrough in plant-based fuels. Includes photo of Sara Volz and a small portrait of her.

food. The algae—which, like plants, store energy in the form of oil—can grow in ponds or tanks. That means they can be cultivated just about anywhere. Despite this advantage, algae biofuels are more expensive to produce than petroleum. To make this more competitive, they have to be similar in terms of cost, says Greg O'Neil, a chemist who studies algae biofuels at Western Washington University. That's why researchers—including Sara—have been trying all sorts of methods to grow algae that yield more oil. A KILLER IDEA One day, Sara had a breakthrough. She decided to use an herbicide that kills algae on her cultures. The trick was to use this herbicide in a way that would not kill the algae. She figured out that algae cells that survived the herbicide could do so only if they were producing higher-than-normal amounts of the enzyme—and therefore, more oil. In other words, artificial selection would leave only the highest oil-producing cells to reproduce and pass on their traits to the next generation. To test her theory, Sara set up her lab—complete with fluorescent lights set to shine for 16 hours each day so the algae could grow. "The actually adapted my sleep schedule to the lights, so they act as my alarm in the morning," she says. To ensure the algae have what they need to make food by photosynthesis, Sara hooked up tubing that bubbles air into the liquid. "The bubbling keeps the algae circulating, so all the cells get good access to light. It also provides a steady source of carbon dioxide," says Sara. Weeks later, Sara measured the oil content of the surviving algae. It was much higher than at the start of the experiment. "When I first saw these results, I thought they were too good to be true," she says. She also tried again and got similar results. Sara, who now is a freshman at the Massachusetts Institute of Technology, plans to continue her research. "She hopes that one day algae biofuels will replace fossil fuels." —Janapriya Adhikari



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SEPTEMBER 2, 2013

Oil Bloom

A Colorado high school student's breakthrough in plant-based fuels

BY JACQUELINE ADAMS | FOR SCIENCE WORLD MAGAZINE

Most people would cringe at the sight of green slime growing under their beds. But not Sara Volz of Colorado Springs.

Beneath her loft bed, the 18-year-old has set up a biochemistry lab, complete with shelves of bubbling flasks in which she's growing plantlike algae. Sara acknowledges that the decor is a bit unusual, but by building her lab in her bedroom, she's able to keep a close eye on her cultures.

Sara was inspired to study algae in seventh grade when she did a science fair project on biofuels. These renewable fuels come from plants and are cleaner than petroleum-based fossil fuels that contribute to climate change when people burn them. During her research, Sara learned that oil from algae is a promising biofuel—the trouble is, it's expensive to produce.

Over the next few years, Sara continued to experiment with algae as a fuel source. All of her hard work finally paid off. She's come up with a solution that could make algae biofuels a viable alternative to petroleum-based fuels. And for her work, she earned first place in this year's Intel Science Talent Search, a prestigious high school science and math competition.

PLANT PROBLEMS

Through her research, Sara learned that crops like corn and soy can be used as biofuel, but these plants have

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downsides. They thrive only in certain climates, and they take up land that could be used for growing food. But algae—which, like plants, store energy in the form of oil—can grow in ponds or tanks. That means they can be cultivated just about anywhere.

Despite this advantage, algae biofuels are more expensive to produce than petroleum. “In order to really compete, [they have] to be similar in terms of cost,” says Greg O’Neil, a chemist who studies algae biofuels at Western Washington University. That’s why researchers— including Sara—have been trying all sorts of methods to grow algae that yield more oil.

A KILLER IDEA

One day, Sara had a breakthrough. She decided to use an herbicide that kills algae on her cultures. The trick was in how this herbicide kills: It interferes with an enzyme—a protein that accelerates a chemical reaction—that enables algae to make oil. Without this oil, the algae die.

She figured any algae cells that survived the herbicide could do so only if they were producing higher-than-normal amounts of the enzyme—and therefore, more oil.

In other words, artificial selection would leave only the highest oil-producing cells to reproduce and pass on their traits to the next generation.

To test her theory, Sara set up her lab—complete with fluorescent lights set to shine for 16 hours each day so the algae could grow. “I’ve actually adapted my sleep schedule to the lights, so they act as my alarm in the morning,” she says.

To ensure the algae have what they need to make food by photosynthesis, Sara hooked up tubing that bubbles air into the liquid. “The bubbling keeps the algae circulating, so all the cells get good access to light. It also provides a steady source of carbon dioxide,” says Sara.

Weeks later, Sara measured the oil content of the surviving algae. It was much higher than at the start of the experiment. “When I first saw these results, I thought they were too good to be true,” she says. But she tried again and got similar results.

Sara, who’s now a freshman at the Massachusetts Institute of Technology, plans to continue her research. She hopes that one day algae biofuels will replace fossil fuels.

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