

UF develops method to make plastic from discarded plant material

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(PhysOrg.com) -- Plastic may compete with paper in the grocery line, but it doesn't have to compete with the world's food supply, according to University of Florida researchers.

They've developed a way to produce [plastic](#) that doesn't use valuable natural resources, such as food or fuel, for raw materials.

The new method uses a strain of bacteria to create bioplastic from discarded plant material, such as yard waste.

Bioplastic, or plastic from renewable resources, is produced when an organism such as a bacterium creates lactic acid while fermenting carbohydrates. The lactic acid can then be converted into long chains of molecules to form plastic.

Current bioplastic production uses food carbohydrates, such as cane sugar or corn starch, as raw materials. Traditional plastic production requires petroleum.

Keelnatham Shanmugam, a UF microbiology and cell science professor, Lonnie Ingram, a distinguished professor in microbiology and cell science, and their co-workers made the development. Their research is published in the May issue of the *Journal of Industrial Microbiology and Biotechnology*.

"As we start using more and more bioplastics, we are infringing upon the

use of food material," said Shanmugam. "We'd like to switch away from food-based carbohydrates to non-food-based carbohydrates for producing plastics."

Using discarded plant material to produce plastic helps keep commodity prices down. The plastic produced from the process is both biodegradable and recyclable, Shanmugam said.

In the study, the researchers tested the bacterium - *Bacillus coagulans* strain 36D1 - for its ability to produce lactic acid in a variety of conditions typical of bioplastic production. The bacterium was collected from a geyser in Calistoga, Calif., which was one of the many places the researchers sampled for bacteria.

Previous attempts to produce lactic acid from discarded plant materials using microorganisms have not yielded enough lactic acid and weren't cost effective.

However, Shanmugam and Ingram found that by adding calcium carbonate to the process, they achieved lactic acid yields as high as those achieved by organisms that fermented food carbohydrates.

Additionally, the heat-tolerant bacterial strain also cut production costs significantly by allowing the process to run at a higher temperature, which reduced the amount of expensive, plant-digesting enzymes required by up to four times.

Cost savings are also achieved by eliminating the need for food carbohydrates as raw materials since discarded plant waste is less expensive. For example, using straw as a raw material is 13 times less expensive than sugar and five times less expensive than corn or wheat.

Mark Ou, a UF biological scientist and the study's lead author, said

increases in oil prices over the last several years have led to more interest in petroleum alternatives for plastic production.

"If we can save some of our oil and turn our plants into our plastic cups and packaging, then we can increase our national security by reducing our dependence on foreign oil," Ou said.

Provided by University of Florida

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