New Uses for Sugar Beet Pulp

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More than 1 million tons of sugar beet pulp are generated annually by U.S. beet sugar industries. Finding profitable uses for the biodegradable pulp, which is the leftover residue from sugar extraction, is critical for the long-term economic viability of U.S. agribusiness.

Agricultural Research Service researchers and colleagues have long been studying the potential of sugar beet pulp utilization. Now, chemist LinShu Liu and plant physiologist Arland Hotchkiss, both with the Dairy and Functional Foods Unit at ARS’s Eastern Regional Research Center in Wyndmoor, Pennsylvania, and colleagues have found new uses for sugar beet pulp.

In collaboration with professor Jinwen Zhang of Washington State University (WSU) in Pullman, Liu and ARS-WSU colleagues developed a biodegradable thermoplastic (meaning plastic that becomes soft when heated) that could be used in disposable food containers.

The bioplastic is manufactured from both sugar beet pulp and a biodegradable polymer called polylactic acid, or PLA, using a twin screw extruder. PLA is a commercially available polymer derived from the sugars in corn, sugar beet, sugarcane, switchgrass and other plants—renewable feedstocks. Extrusion is a cost-effective manufacturing process that is popularly used in large-scale production of food, plastics, and composite materials. Many biopolymers and their composite materials with petroleum-based polymers also can be extruded.

The scientists showed that up to 50 percent sugar beet pulp can be incorporated with PLA, and the resulting thermoplastic composites retain mechanical properties similar to those of low-density polyethylene—the commonly produced materials used for opaque plastic containers, bags, and film coverings. It can also be blended with PLA and other biodegradable polymers for enhanced water resistance. The composite could function as a lightweight-bearing material comprising up to 98 percent sugar beet pulp.

This continued development of the sugar beet pulp plastic—for example as yogurt cups, cottage cheese tubs, or other thin, opaque plastic containers—could benefit sugar beet growers and beet sugar processors. More findings were reported in the *Journal of Polymers and the Environment* and *Industrial & Engineering Chemistry Research* in 2011.

The new composite plastics containing sugar beet pulp are cost competitive when compared to materials that are made solely of PLA, according to Liu and Hotchkiss. “The technology is promising and provides a ‘green’ material for food packaging,” says Hotchkiss. —By Rosalie Marion Bliss, ARS.

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