

Who ARS Serves: Consumers, Farmers, Communities, and Research Partners

ARS research enhances the competitiveness of U.S. agriculture by improving the quality and marketability of harvested foods and agricultural feedstocks. The development of new agriculturally based materials is beneficial to farmers, consumers, and retailers because the products are environmentally friendly, support more diverse crop markets, and enhance economic opportunities for rural communities.



The following accomplishments in 2022 are examples of how ARS researchers develop these products.

Environmentally friendly bioplastic from dairy waste. Agro-based materials are increasingly used to replace petroleum-based feedstocks because they are sustainable, eco-friendly, easier to recycle, and non-toxic. ARS researchers in Peoria, Illinois, utilized a sugar called lactose, which is a cheap and widely available byproduct of cheesemaking and casein production, to make polyurethanes via a newly developed green microwave process that eliminates the standard industry use of toxic catalysts needed to accelerate reaction. This microwave procedure was found to reduce the reaction time and save energy relative to conventional heating, and the lactose-based polyurethane can be mixed with additional polymers to generate different plastics. These bioplastics are suitable for biomedical applications and for replacing polymers made from petroleum-based materials and can generate added revenue for the dairy industry. (NP 306)

Hemp seed oil-based margarine for health-conscious consumers. Cold-pressed hemp seed oil (HSO) is known to have many bioactive phytochemicals that promote human health and is low in saturated fats. ARS researchers in Peoria, Illinois, used their oleogel technology—a process where semi-solid fat or oil replaces unhealthy solid fats and is combined with natural waxes to make margarine—to create a HSO-based oleogel. When compared with commercial grade margarine spreads for hardness, HSO oleogel was achieved with less than 3 percent wax, whereas hardness for commercial stick margarines required up to 7 percent wax. This information is important for food companies seeking a way to develop healthier spreads that incorporate oils with low levels of saturated fats and healthful bioactive components. Margarines based on HSO will be highly desirable for health-conscious Americans. MARS Inc. and ParagonPure have expressed interest in this technology. (NP 306)

Improved fermentation of unrefined biomass sugars into biofuels. Unrefined sugars extracted from agricultural residues are difficult for industry to process into biofuels because they contain other chemicals that inhibit fermentation. One of the most problematic of these is acetic acid, because it persists throughout fermentation, dramatically lowers production even at modest concentrations, and is expensive to remove using current technologies. ARS researchers in Peoria, Illinois, developed a process to conveniently remove acetate and other chemical inhibitors that does not require additional equipment, compared to other detoxification methods. The heart of the process is the fungus *Coniochaeta ligniaria*, which is especially good at growing on acetate. The process was also successful for fermenting sugars prepared from acid treated biomass such as rice hulls, which are notoriously difficult to ferment because of their high acetate content. Fermentation of biomass treated with this fungus resulted in high biofuel yields. While this new fermentation process is of interest to rice farmers looking for a new market for their hulls, it also directly benefits all agricultural processors interested in biofuel production. Several universities recently received NIFA funding to apply this research to regional biomass feedstocks. (NP 306)

Catfish bone powder increases the appeal of fried catfish strips. Catfish bones or frames are a waste product of the filleting process. ARS scientists in New Orleans, Louisiana, and Louisiana State University colleagues transformed catfish frames into a high calcium, safe-to-eat bone powder and incorporated it into breading mixes. Fried catfish strips coated with bone powder mixes generated positive feedback and favorable acceptance from consumers, and information about bone powder utilization increased consumer interest in product purchases. Using this catfish byproduct in prepared foods can reduce waste from the aquaculture sector, enhance value for producers, and increase calcium in foods without hindering sensory quality. (NP 306)



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