

Agricultural wastes yield biosurfactants for biocosmetics

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Large quantities of plant stalks, fruit and vegetable skins, husks and pods occur as waste in organic farming. In an EU-funded project researchers at the Fraunhofer IGB, in cooperation with international partners from science and industry, intend to use this waste to produce biosurfactants for natural cosmetics.

Surfactants are found in cleaning agents and detergents, also in cosmetics. Shampoos, shower gels and bath additives consist of up to 40 percent surfactants. They reduce the surface tension of water, so that oil can be mixed with water. Annually about 18 million tonnes of surfactants are manufactured, mainly by chemical means and on a petroleum base. A quarter is now manufactured from the oils of renewable resources, generally coconut or palm kernel oil. Microorganisms also produce washing-active substances that are called biosurfactants. However, only few of these biosurfactants are manufactured industrially, since their production is still comparatively expensive. In order to make biosurfactants economically profitable for natural cosmetics, researchers at the Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB are developing a sustainable, cost-cutting production process in an EU-funded project. This project was launched on 1st January 2012 and is named "O4S – Sustainable surfactant production from renewable resources through natural fermentation for applications in natural, organically-certified products".

For this purpose, the researchers intend to use wastes containing cellulose or oil and residual materials from organic farming as resources for a biotechnological process. Cellulose is a natural polymer consisting of sugar units which occurs in all plant components. If cellulose is converted into its basic building block glucose, the sugar molecules are available to the microorganisms as a substrate. "Various bacteria and fungi form biosurfactants from these sugars or also oils under natural conditions. The microorganisms can be cultivated in a bioreactor and the biosurfactants obtained industrially," explains the biologist and engineer Susanne Zibek.

In the project first of all various naturally occurring strains of microorganisms are examined with regard to their potential applications. Important parameters for the fermentation process are: which strains can be cultivated in a stable manner in the bioreactor, which surfactants they produce and in what quantities. A further challenge for the researchers is the economical and, at the same time, ecological purification of the substances from the fermentation broth. "Here we will only use resource-conserving downstream processing methods," explains Dr. Ana Lucia Vasquez, who coordinates the project with all the partners. In comparison with conventionally produced

detergents from petroleum resources, biosurfactants are environmentally more sustainable, biocompatible and biodegradable. Because of their more complex structure they can potentially have a greater range of effects. Some biosurfactants even have an antimicrobial effect which, as a component of cleaning agents, makes them interesting for skin care. Other surfactants are foaming agents and bind dirt, which is why they occur in shower gels and shampoos. The biosurfactants, which are produced observing strict ecological regulations, could also be used for applications in the food industry and pharmaceutical sector, also in restoration of the environment after oil disasters and the detoxification of wastewater.

“The use of waste products from organic farming both reduces the production costs and also ensures the sustainability of the biosurfactants,” says Vasquez. “We will accompany all the certification steps. In this way large quantities of waste from certified ecological farming can be used effectively.” In the EU ecologically certified products have to consist of at least 70 percent organically produced components, and foodstuffs even 95 percent. In order to guarantee this, the researchers of the Fraunhofer IGB work together with partners such as NATRUE: International Natural and Organic Cosmetics Association (BE), Naturland – Verband für ökologischen Landbau e.V. (DE) and Green Sugar (DE) as well as Intelligent Formulation (UK), Farfalla Essentials (CH), Grüne Erde (AT), Biotrend (PT), Cremer Oleo (DE), VITO (BE), Institut Dr. Schrader Creachem (DE), Asociacion Riojana Profesional de Agricultura Ecologica (ES) and Cevkor Vakfi (TR).



Agricultural wastes from certified producers will provide biosurfactants for cosmetic products. © Fraunhofer IGB
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