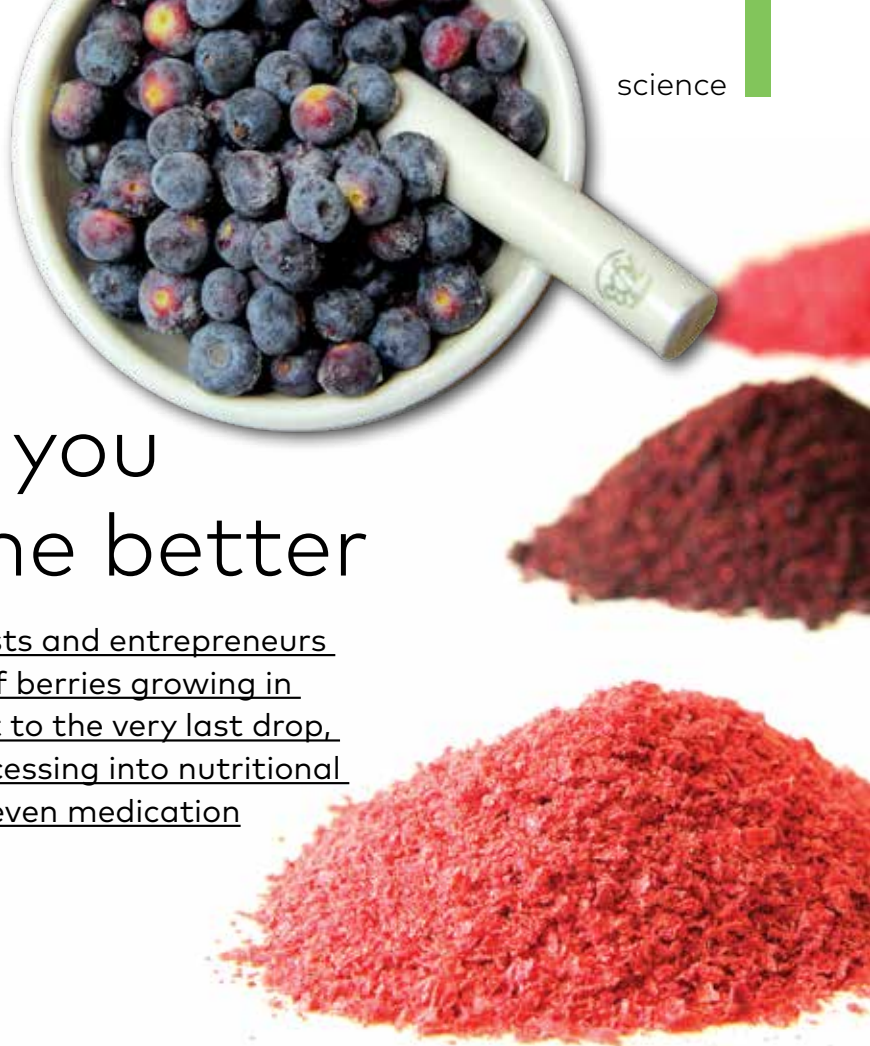


text / Lāsma Vaivare
 photo / Toms Grīnbergs, University of Latvia,
 SIA Silv EXPO publicity photo



The more juice you squeeze out, the better

A collaboration of Latvian scientists and entrepreneurs brought about plans to use the power of berries growing in Latvian forests and swamps — and do it to the very last drop, turning pomace left over from food processing into nutritional supplements and in the future possibly even medication

Do you remember your grandmother telling you to eat fruit with its skin? Nutritionists also remind us about the valuable substances found in fruit, vegetable, and berry skins. «Skin is the most valuable part,» agrees Ruta Muceniece, Professor at the Faculty of Medicine of University of Latvia (LU), who together with colleagues and *Silv EXPO Ltd* attracted financial support from the European Union (EU) and is searching for ways to efficiently use waste products — berry pomace remaining after the juice production process.

The power of local berries

«The goal of the project is to develop methods of creating new high-value-added products from pomace of *Vaccinium* berries, moreover, using an environmentally friendly method — supercritical CO₂ extraction. We have developed the extraction methods, samples of substances have been obtained, researchers from the Faculty of Medicine are carrying out research on pharmacological activity, and *Silv EXPO Ltd* are doing the market analysis,» says Māris Kļaviņš, Professor at the Faculty of Geography and Earth Sciences of LU. The genus of *Vaccinium* berries includes blueberries, bog bilberries, blue huckleberries, lingonberries and cranberries. Overall it has around 450 berry species. The nutritional value of berry pom-

INFORMATION

- *Vaccinium* berry processing — green technologies and innovative, pharmacologically described products for biopharmaceuticals
- Implementation period — February 2017 — January 2020
- Goal — to develop an innovative and efficient health promoting product within the framework of knowledge-based biopharmaceuticals
- Partners — University of Latvia, *Silv EXPO Ltd*
- Financing — University of Latvia — around EUR 645 000, of which EUR 548 200 is ERDF funding

SOURCE: UNIVERSITY OF LATVIA

ace is relatively low, at the moment the efficiency of use is also low, the Professor continues. Berry pomace is sour, it is impossible to use it to feed animals, a small part is used as tea additives, some make berry powder. Consequently, obtaining purified biopharmaceuticals is positively evaluated in terms of valorization and circular economy.

In vitro test results show that provisions are made for selecting the most effective classes of biologically active substances and identifying the most promising therapeutic fields of application, as well as determining the required dosage. It is expected that the project will result in an innovative science-based nutritional supplement with standardized content and therapeutic effects, not excluding the possibility of producing medication in the future. The optimal form of the finished product is still considered, but Ilona Vanaga, R&D manager of *Silv EXPO Ltd*, says that they could use liposomal delivery form, which ensures increased product's bioavailability. A liposome is a small vesicle with a lipid bilayer or micelle that encapsulates active ingredients and successfully transports them through the digestive tract, shielding them from gastric acid, for example. Which in turn ensures that the active ingredient works as intended and where intended. I. Vanaga adds that the company has already created the liposomal form of fir-needle extracts as another project and the technology is applicable here as well.

Silv EXPO Ltd pays great attention to active ingredients of Latvian spruce and pine needles — polyphenol, sil-biolium, chlorophyllin — and their efficient use in health improvement.



After extraction of juice from berries a lot is left over, indicates Scientific Assistant of the Faculty of Geography and Earth Sciences Linards Kļaviņš and Laboratory Assistant of the Faculty of Geography and Earth Sciences Lauris Arbidans.



Professors of the Faculty of Medicine Ruta Muceniece and Researcher of the Faculty of Medicine Jana Namniece are actively engaging in research.



The company is engaged in scientific research, pharmacoeconomic research, in creation of natural raw materials and new extractives starting from the idea up to the technology, Uģis Klētnieks, Development Director of *Silv EXPO Ltd* introduces his company. The company is interested in using natural substances in order to delay aging processes, improve sports achievements, for treatment and prevention of oncological diseases and improvement of immunity.

For various ailments

«We are focusing on two substance groups — lipids, including berry oils that we are still working on, and polyphenols,» says M. Kļaviņš. Whereas R. Muceniece adds that at the moment they «have been focusing on antioxidants and how these extractives help cells survive under oxidative stress, as well as their antidiabetic properties. A cell may experience

oxidative stress due to a variety of agents, imbalance of oxidation-reduction causes appearance of more free radicals. In parallel we are researching how isolated active ingredients affect the differentiation of stem cells into fat cells — chondrocytes. We have started research on anti-inflammatory effect.» Research description states that the aim is to search for effects of the substance in models of inflammation, aging, hepatoprotective actions, oxidative stress reduction, etc., as well as to research intracellular signalling, mitochondrial and DNA integrity, as well as energy production. Asked about the results of the research carried out thus far, R. Muceniece says that berry extractives have good qualities. However, it might be problematic to standardize berry extractives — their composition may vary depending on weather, period, and location when and where the berries were collected. Still, if one wants to man-

INFORMATION

OTHER IDEAS

— *Smiltenes piens Ltd* create whey protein drinks from whey – a liquid that has remained after dairy processing, which usually turns into production waste or is used in animal husbandry.

— *Valmiermuižas alus Ltd* use malt residue, a by-product of brewing beer, in producing sweets, and by adding other raw materials they bake cookies.

— *BIOLAT JSC* obtain extractives from pine and spruce needles, which remain as waste at felling areas. These extractives are used to produce nutritional supplements and skin care products.

SOURCE: MINISTRY OF AGRICULTURE



Silv EXPO Ltd is interested in using natural substances for delaying aging processes, strengthening immunity, improving sports achievements, and preventing oncological diseases, says Uģis Klētnieks, Director of the company's development department.

LEARN MORE

Follow berry pomace research process in the photo gallery

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ufacture products, their properties must be constant, or, quoting I. Vanaga, «Every package must be effective, not every second one.» To ensure constant quality and volume of output, the solution might lie in berry cultivation or specific fractionations and purification of the extractives. Even this will be the benefit from the project — knowledge for pharmaceutical and chemical industries, says U. Klētnieks, at the same time admitting that plants that grow in the wild have a tremendous power. Wild plants are geared towards survival, they know how to protect themselves from UV radiation, fluctuating temperatures, wind, hail, rain, and other plants wanting to replace them. Will these abilities be commercially available as pills, capsules, or other forms? Even though no one is in a hurry to promise mass production at the moment, a pilot batch of knowledge-based food supplements must be ready within two years. ●



Smart way of using biological resources

DAGNIJA BLUMBERGA

Professor, Director of the Institute of Environmental Protection and Heating Systems of Riga Technical University:

It is globally considered that biotechnomy is a fundamentally new smart approach in using biological resources, there is no doubt that its importance will increase over time. The goal of biotechnomy is the smart way of using biological resources, creating high-demand high added value products with the help of technology instead of disposing of them at landfills or burning them. As a result, the products are environmentally and climate friendly, as well as socioeconomically and economically justified. The philosophy of the biotechnomy is rooted in the idea of optimizing the benefits based on the available biological resources, available and projected technological levels and economic conditions. You can come across raw materials for biotechnomy manufacturing in Latvia everywhere, and their range is very wide, including the flora and fauna of soil and of water, as well as waste — not only household waste, but also, for example, industrial gas emissions and by-products and remnants of agricultural production. By converting biomass, we can obtain energy, building materials, food, medication, cosmetics, chemicals, textiles, and other products.

There has been public debate about the problem of increasing accumulation of waste tires. Usually they are made from a mixture of natural and various synthetic rubbers, fillers, and other substances. Tire decomposition is a long process, it is important to find solutions to the problem by turning them into high-quality products using appropriate technological methods. Our researchers have been working on this problem for several years. Let us look at another example — wood. Wood covers half of Latvia's territory and is the most widespread group of biological resources with a great hidden potential for use, however, presently approximately 50 % of harvested timber is used as fuelwood, 30 % as sawn timber and building materials, and 20 % of timber is used for making 20 thousand various products. Timber is mostly used to produce energy, but global scientific research shows that it has a potential for creating a number of high-quality products with significant high added value. The research carried out at RTU Institute of Environmental Protection and Heating Systems confirms that large-scale use of timber for acquiring fuelwood and sawn timber is not sustainable. This is why we must think in two directions, of which the need to take the wood industry to the next level in order to manufacture products with high added value would be the most important one. We must improve subsidiaries that are ready to manufacture, for example, heat insulating materials from conifer shoots, betulin from birch bark, or furfural from wood chips. ●