Natural pigments and useful raw materials from autumn leaves for industry

November 2 2016

Credit: Technical Research Centre of Finland (VTT)

Autumn leaves contain a range of interesting substances such as

pigments, carbohydrates, proteins and compounds that inhibit the growth of harmful bacteria. VTT Technical Research Centre of Finland is developing leaf-processing technologies, which could be used by the cosmetics, textile and feed and food industries.

Very little use has been made of fallen leaves so far. They are either left on the ground, composted or burned resulting in full landfills and a growing carbon dioxide load.

Autumn leaves derive their colour from orange and yellow carotenoids and red anthocyanins. In addition to pigments, autumn leaves contain many beneficial compounds, such as phenols, lignin, carbohydrates and protein. There is a fast-growing need for natural pigments in various industries around the world - for example, these natural pigments can even have health-promoting effects and use as nutraceuticals.

In a process developed by VTT, leaves gathered in gardens and parks are dried and ground, and compounds are extracted. The processing stages were developed by VTT in laboratory experiments; R&D has now entered the piloting stage, using leaf material collected in the Otaniemi area by waste disposal company Lassila & Tikanoja. Special attention has been paid to the environmental friendliness of the overall process and the safety of the compounds produced.

Credit: Technical Research Centre of Finland (VTT)

"In laboratory experiments, we discovered several, promising alternative ways of utilising leaves. Piloting assays are under way, in which we are examining how our methods work in practice and what quantities of valuable compounds can be extracted from the leaves," comments Liisa Nohynek, Senior Scientist at VTT.

Pigments for cosmetics and textiles

Pigments from autumn leaves can be used to colour cosmetics and

textiles. The chemical composition of leaves varies largely between different tree species. Added value can be obtained by processing the autumn leaves of certain tree types only, thereby producing well-defined compounds suitable for new products.

Residual biomass, which is remaining after extraction, is high in nutrients and suitable for soil improvement in home gardens. On the other hand, this waste can also be further processed to compounds that inhibit the growth of harmful microbes, thus being suitable e.g. for cosmetic and hygiene products.

Credit: Technical Research Centre of Finland (VTT)

Nohynek believes that the methods developed by VTT are applicable for raw material processors and for example in textile and cosmetic industries. In addition, the residual material offers business opportunities for firms in the horticultural, cosmetics, hygiene and pharmaceutical sectors.

Future prospects: bioactive compounds and

nutritional supplements

Furthermore, also other applications could be developed for autumn leaves. Compounds obtained from the leaves may be suitable for use as food colouring and preservatives, and as nutritional supplements. In addition, these colourants could be used to improve the nutritional properties of edible plant cells under development at VTT. New bioactive compounds could be obtained for the cosmetic and pharmaceutical industries, by using biotechnological methods to modify pigments. In addition, the carbohydrates from the extraction residue could be used to produce protein-rich feed for livestock and protein supplements for people. Furthermore, the nutrient-rich residual biomass can also have domestic applications, for example in growing mushrooms.

Provided by VTT Technical Research Centre of Finland