

Pine needles from old Christmas trees could be turned into paint and food sweeteners in the future

December 27 2018



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Abandoned Christmas trees could be saved from landfill and turned into paint and food sweeteners according to new research by the University

of Sheffield.

Christmas [trees](#) have hundreds of thousands of pine needles which take a long time to decompose compared to other tree leaves. When they rot, they emit huge quantities of greenhouse gases which then contribute to the carbon footprint of the UK.

Cynthia Kartey, a Ph.D. student from the University of Sheffield's Department of Chemical and Biological Engineering, has found that useful products can be made from the chemicals extracted from pine needles when processed.

The major component (up to 85 per cent) of pine needles is a complex polymer known as lignocellulose. The complexity of this polymer makes using pine needles as a product for biomass energy unattractive and useless to most [industrial processes](#).

Cynthia said: "My research has been focused on the breakdown of this complex structure into simple, high-valued industrial [chemical](#) feedstocks such as sugars and phenolics, which are used in products like household cleaners and mouthwash.

"Biorefineries would be able to use a relatively simple but unexplored process to break down the pine needles."

With the aid of heat and solvents such as glycerol, which is cheap and environmentally friendly, the chemical structure of pine needles is broken down into a liquid product (bio-oil) and a solid by-product (bio-char).

The bio-oil typically contains glucose, acetic acid and phenol. These chemicals are used in many industries—glucose in the production of sweeteners for food, acetic acid for making paint, adhesives and even

vinegar.

The process is sustainable and creates [zero waste](#) as the solid by-product can be useful too in other industrial chemical processes. Fresh trees and older, abandoned Christmas trees can both be used.

Cynthia continued: "In the future, the tree that decorated your house over the festive period could be turned into paint to decorate your house once again."

The UK uses as many as 8 million natural Christmas trees during the festive period every year and sadly, about 7 million trees end up in landfill.

If pine needles were collected after Christmas and processed in this way, the chemicals could be used to replace less sustainable chemicals currently used in industry.

This could lead to a decrease in the UK's carbon footprint by reducing the UK's dependence on imported artificial plastic-based Christmas trees and a reduction in the amount of biomass waste going to landfill.

Dr. James McGregor, Senior Lecturer in the Department of Chemical and Biological Engineering said: "The use of biomass—materials derived from plants—to produce fuels and chemicals currently manufactured from fossil resources will play a key role in the future global economy."

"If we can utilise materials that would otherwise go to waste in such processes, thereby recycling them, then there are further benefits."

"In our research group we are currently investigating the production of valuable products from a variety of organic wastes, including forestry sources, spent grain from the brewing industry and food waste; alongside

investigating processes for the conversion on carbon dioxide into useful hydrocarbon compounds"

Provided by University of Sheffield

Citation: Pine needles from old Christmas trees could be turned into paint and food sweeteners in the future (2018, December 27) retrieved 7 February 2023 from

<https://phys.org/news/2018-12-needles-christmas-trees-food-sweeteners.html>

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