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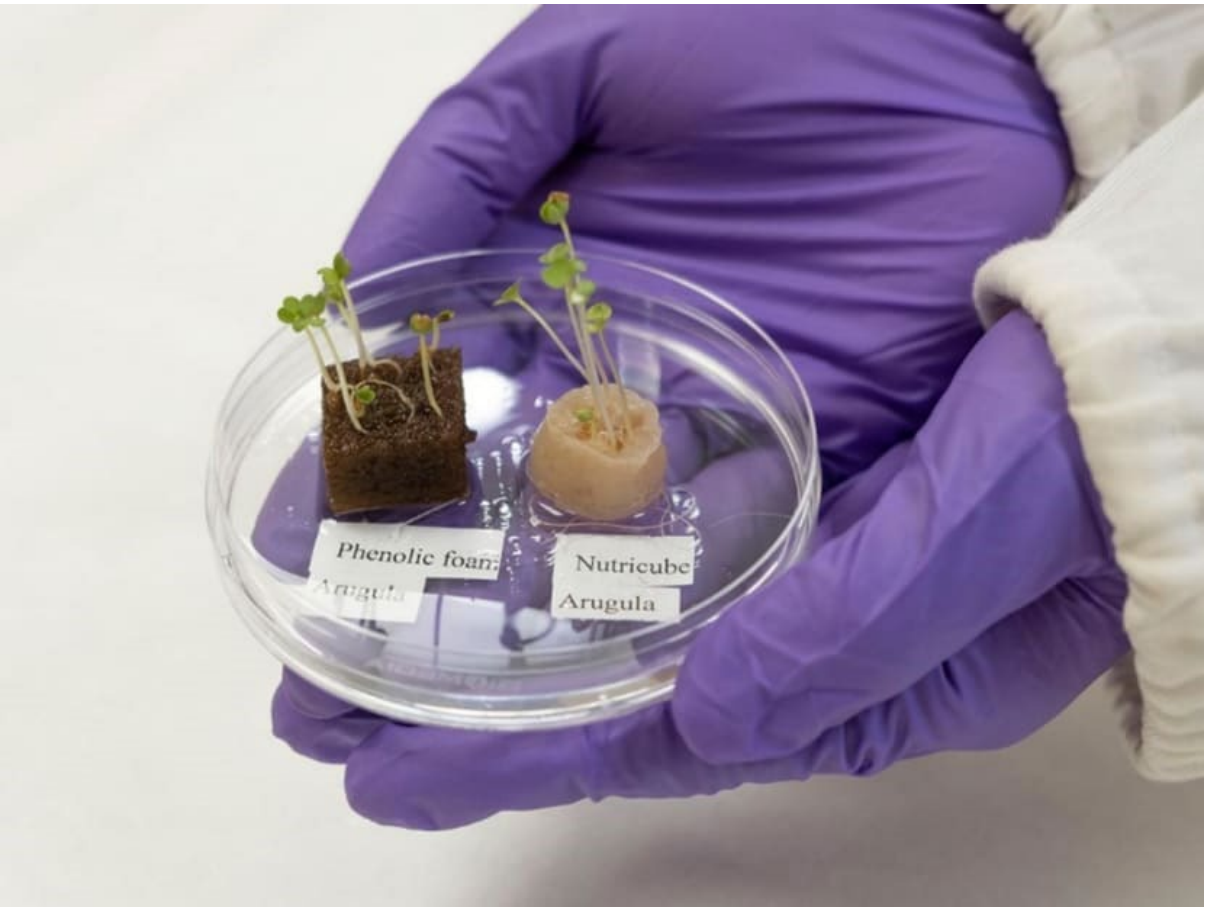
today

# NTU researchers develop greener way to grow vegetables, using human hair instead of soil




Nanyang Technological University

Keratin-based substrates being used to help plants grow. A gram of human hair can produce about three blocks of substrates of about 1.5cm by 1.5cm by 3cm, or the size of a small ice cube.



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SINGAPORE — Nanyang Technological University (NTU) researchers have found a new way to grow vegetables: By using discarded human hair instead of soil.

The team, consisting of NTU's Professor Ng Kee Woei and Professor Hu Xiao as well as seven other researchers from NTU and Harvard University, used keratin extracted from hair to create a sustainable substitute for growth mediums used in urban farming.



Keratin is a type of protein found in hair, skin and nails, as well as in animal wool and bird feathers.

Prof Ng, the associate chair (research) at NTU's School of Materials Science and Engineering, pointed out that livestock farming also produces large amounts of keratin as biowastes, because it is found abundantly in wool, horns, hooves and feathers.

"Since keratin can be extracted from many types of farm wastes, developing keratin-based hydroponic substrates could be an important strategy for recycling farm wastes as part of sustainable agriculture," he said.


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In hydroponics, crops are grown without soil. Instead, a substrate is used to act as a support structure and reservoir for water and nutrients.

Hydroponic substrates, used in urban farming here, only serve to keep the plant rooted in place and absorb the water delivering nutrients to the plants flowing below the substrate.

These growth mediums, usually made from non-sustainable and non-biodegradable materials such as rockwool, polyurethane and phenolic foams, create more waste when farmers throw them away after use.

In contrast, the keratin-cellulose substrate created by NTU researchers contains its own source of nutrients for plant growth and is able to release them under controlled conditions.

The substrate is also made with cellulose fibres extracted from softwood pulp, making it sustainable while also leaving no waste behind after use.

The keratin-cellulose substrate could also be tailored to each plant's specific nutritional needs to help enhance germination, crop yield and overall plant health.

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The researchers chose to use human hair out of all the available biowastes due to it being abundantly available and it containing keratin – a protein that contains amino acids, which are a source of nutrients for plant growth.

The amino acids help bind other types of nutrients and release them under controlled conditions, which is important in urban agriculture, where the timely release of nutrients and water is crucial.

The keratin is then combined with the cellulose fibre to strengthen the substrate and improve its water-swelling capabilities.

The one downside of this keratin-based substrate is that it costs two to three times more to make than current commercial foams.

The team does not have any specific plans for commercialisation as of now, Prof Ng said, but it is in touch with industry partners to do some field tests.

"Hopefully within the next three years, we can put the first product in the market," he said.