

Prawn shells, fruit waste combine to find new life as food packaging

Vanessa Liu

Prawn shells, orange peels and apple cores get tossed into the bin every day without a second thought.

But scientists here have found a way to turn them into chitin, a biopolymer that can in turn be made into food-grade packaging, using a completely organic process.

The biodegradable packaging material could kill the proverbial two birds with one stone; since it could potentially replace plastic containers used for food takeaways, it would help Singapore reduce its single-use plastic waste.

Plastic and food accounted for about 40 per cent of the Republic's total amount of waste last year.

Around 893,000 tonnes of plastic and 607,000 tonnes of food waste were thrown out.

In a process devised by a team from Nanyang Technological Uni-

versity's food science and technology (FST) programme, food waste is converted into chitin organically and without using chemicals, said Professor William Chen, the Michael Fam chair professor and FST director, who is also the principal investigator in this project.

Prawn shells are first removed and placed in a flask of water together with some fruit waste, such as grape skin. The glucose in fruit waste is needed to kick-start the fermentation process that breaks the shells down.

Other kinds of waste, including mango peel, sugar cane molasses, apple core and potato skin, were also used, but red grape skin proved to be the most effective in accelerating fermentation, said Prof Chen.

After 24 hours, the water starts to turn turbid when microbes start growing in the solution. Fermentation removes minerals and protein residue from the shells.

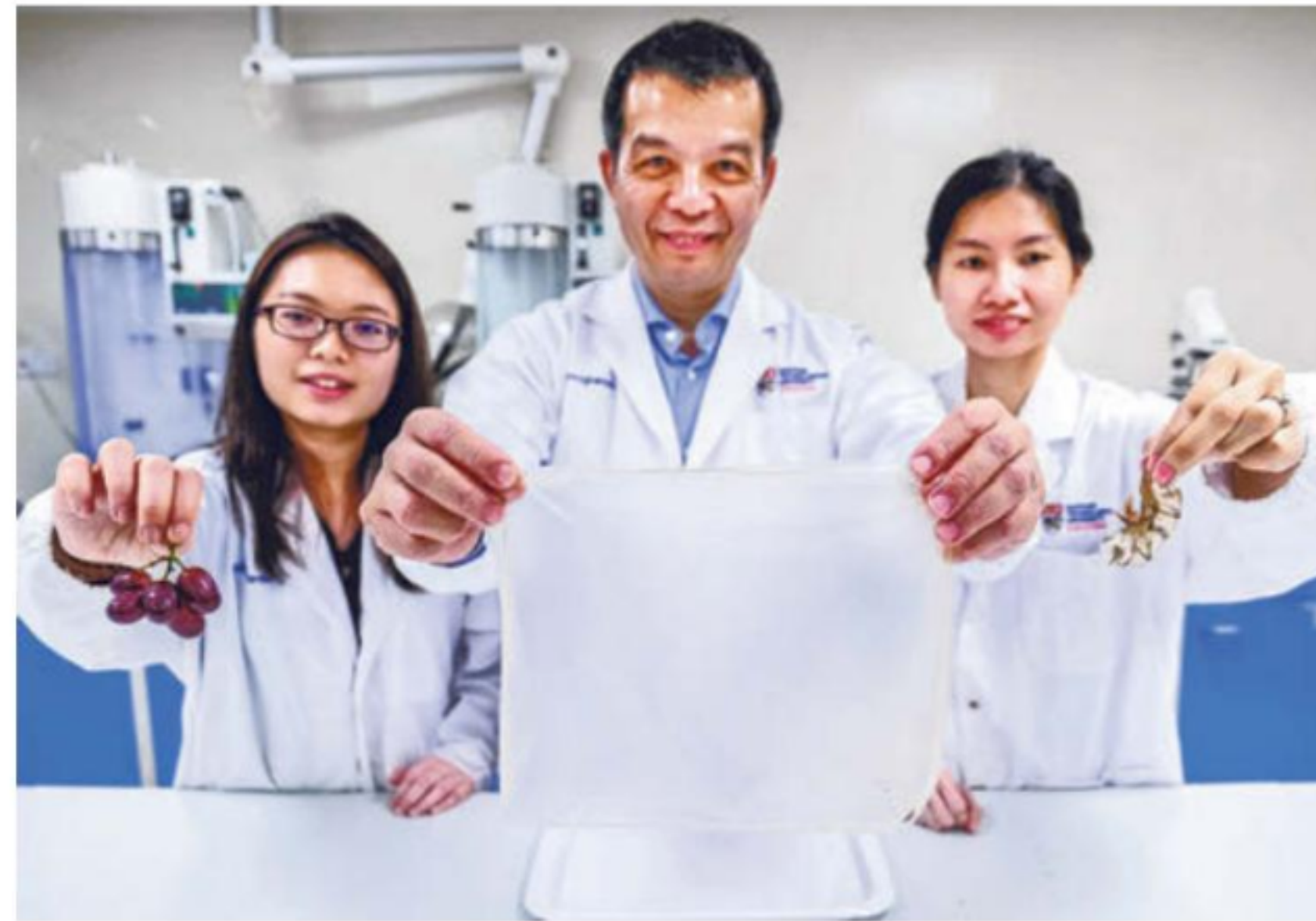
The mixture is then filtered and the shells are dried in an oven to remove all moisture. Afterwards, they are ground into powder.

The resultant material is chitin, a naturally occurring biopolymer found in fungi and the exoskeleton of some insects and crustaceans. It is commonly used in cosmetics and other skincare products.

In a separate process, chitin can be converted into chitosan by adding alkalis, such as sodium hydroxide. The solution is then put in a mould and dried to form a thin packaging film that can be used to pack food. The entire process can take up to five days.

About 20 to 30 per cent of a prawn shell is made up of chitin, which means 5g of shells can produce 1g of chitin.

The team, whose research findings were published in the peer-reviewed journal *AMB Express* in January, is in talks with hotels and



(From left) Nanyang Technological University research officer Lee Pei Pei, Professor William Chen, director of NTU's food science and technology programme, and PhD student Tan Yun Nian, with the food-grade film packaging created from prawn shells and grape skins.

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restaurants here to commercialise the process.

"The current way of extracting chitin from crustacean waste generates a lot of chemical waste," said Prof Chen. "Our process is completely organic; you need only food waste and water."

Each year, six to eight million tonnes of crustacean waste – consisting of crab, shrimp and lobster shells – are produced globally.

Demand for seafood is growing as more people become more affluent, said Prof Chen.

"Our method takes crustacean

and fruit waste and uses natural fermentation processes to extract chitin. This is not only cost-effective, but also environmentally friendly and sustainable, and helps to reduce overall waste," he added.

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