

NTU scientists develop fungi-based protein more nutritious than plant-based meat substitutes



Director of NTU's Food Science and Technology programme Prof William Chen with oyster mushrooms cultivated from a base of discarded soya bean skin. PHOTO: NTU



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SINGAPORE - A new type of alternative protein made from fungi, which is healthier, tastier and greener than plant-based meat substitutes, could soon become available to consumers.

Scientists from Nanyang Technological University (NTU) have been able to cultivate fungi from a base of nutrient-rich food waste, such as soya bean skin, wheat stalk and brewers' spent grain - a by-product of the beer-making industry.

The researchers hope to commercialise their solution by 2024.

Professor William Chen, director of NTU's Food Science and Technology (FST) programme and leader of the team that developed the food product, said that when grown on food waste, the edible white mushroom (*Agaricus bisporus*) can absorb all its essential nutrients such as protein, iron and amino acids.

As a result, added Prof Chen, it is more nutritious than the ingredients commonly found in plant-based meat alternatives such as peas, chickpeas, wheat, gluten and soya.

He noted that a major challenge facing the plant-based proteins sector is infusing these alternative meats with the essential nutrients so they are made comparable to animal meat.

Growing fungi on food waste could also help to enhance its growth and double its yield - with the mushrooms cultivated by NTU fruiting in just two weeks, compared with commercial methods, which take around a month.

The fungi-based proteins can be a lot cheaper to produce compared with plant-based meat, said Prof Chen.

Mushrooms, for one thing, can be grown indoors in the dark, and they are a lot more energy- and water-efficient compared with crops needed for plant-based proteins, such as soya beans that would have to be grown in urban farms.

"In addition, being naturally rich in protein and micronutrients like minerals and vitamins, with a texture and taste profile similar to that of real meat, a lot less processing would be needed to convert the fungi into alternative protein, which also helps bring down production costs," he added.

By reusing common food waste by-products and turning them into high-value proteins, creating these fungi-based proteins can also have mitigating impacts on the environment, said Prof Chen.

It is estimated that around 39 million tonnes of spent grains and 14 million tonnes of soya bean skin, also known as okara, are thrown into landfills around the world each year, where they decompose and add to greenhouse gas emissions.



To scale up the fungi cultivation method, the NTU team is collaborating with The FoodBowl, a food-processing facility supported by the New Zealand government to help food businesses and start-ups innovate, scale up and commercialise new products to international scale.

One New Zealand start-up that is collaborating with NTU's FST programme to implement the fungi cultivation technology in its food products is Off-Piste Provisions, a plant-based meat company.

Mr Jade Gray, its chief executive, said he was confident the collaboration would allow his company to craft a range of fungi-based meat products in New Zealand that mimic the taste, texture and protein content of animal products.

Start-ups in the Asia-Pacific region that develop plant-based proteins received US\$220 million (S\$306 million) in funding last year, of which a large percentage went into research and development to boost the texture and taste of their products to resemble that of meat - which could help mainstream consumers to accept plant-based proteins.

Commenting on NTU's innovation, Ms Mirte Gosker, acting managing director of the Good Food Institute Asia Pacific, Asia's leading alternative protein think-tank, said that with adequate investment and support, these proteins being scaled up at NTU could almost single-handedly resolve the global protein deficit.

She noted that research aimed at accelerating the development of fungi-based foods can expand food choice available to consumers, spur the creation of new companies, and strengthen Singapore's global economic competitiveness while allowing the Republic to produce 30 per cent of its nutritional needs locally by 2030.