03/22/2022 - Nanyang Technological University

Oils from microalgae could replace palm oil in food production

(https://rs1.chemie.de/images//167578-75.jpg)

NTU Singapore

Powdered microalgae washed, dried and treated with methanol by NTU researchers, right a vial of microalgae-derived oil.

A team of scientists led by **Nanyang Technological University, Singapore (NTU Singapore)** has developed a method to effectively produce and extract plant-based oils from a species of common microalgae .

Since the oils extracted from the microalgae are edible and have better properties than palm oil, the newly discovered method could be a healthier and more environmentally friendly alternative to palm oil.

Compared to palm oil, the oil extracted from the microalgae contains more polyunsaturated fatty acids, which may help lower "bad" blood cholesterol levels and reduce the risk of heart disease and stroke. Developed in collaboration with scientists at the **University of Malaya, Malaysia** , the microalgae oil also contains less saturated fat, which has been linked to stroke and related conditions.

Palm oil is the world's most popular vegetable oil, found in about half of all consumer products, and plays a central role in a variety of industrial applications[1]. In 2018, farmers produced 77 million tons of palm oil for the global market and this amount is expected to increase to 107.6 million tons by 2024[2].

However, the rapid expansion of oil palm plantations has been blamed for massive deforestation in several countries[3], destroying the habitat of endangered native wildlife.

To make the oils, pyruvic acid, an organic acid found in all living cells, is added to a solution containing the algae *Chromochloris zofingiensis* and irradiated with ultraviolet light to stimulate photosynthesis. The NTU team separately developed a cost-cutting innovation to replace the microalgae culture medium with fermented soybean residues while improving the yield of microalgae biomass.

After 14 days, the microalgae are washed, dried and then treated with methanol to break the bonds between the oils and the algal protein so that the oils can be extracted. The team also developed green processing technology to efficiently extract vegetable oils derived from microalgae.

It would take 160 grams of algae to produce enough vegetable oil to make a 100 gram chocolate bar.

The algal oil innovation represents a potential alternative to growing palm trees for oil extraction. It also reflects NTU's commitment to reducing our impact on the environment. This is one of the four great challenges facing humanity that the university aims to address with its **strategic plan NTU 2025** .

The results of the study were published in February in the peer-reviewed journal ***Journal of Applied Phycology*** .

Professor William Chen, Director of NTU's Food Science and Technology (FST) programme , who led the project, said: "The development of these vegetable oils from seaweed is another achievement for NTU Singapore as we look for successful ways to Solving problems in the agri-food chain, particularly those that have negative impacts on the environment. Discovering this potential food source for humans is an opportunity to reduce the impact of the food supply chain on our planet."

A triple approach to climate change: algae

The technique developed by NTU is not only a greener alternative to growing palm trees for vegetable oils or fats, but also has the potential to reduce greenhouse gas emissions and food waste.

The scientists say that producing vegetable oils on a larger scale using natural sunlight instead of ultraviolet light would help remove carbon dioxide from the atmosphere by converting it into biomass and oxygen through photosynthesis. As the microalgae grow, they convert carbon dioxide into biomass relatively quickly.

In a separate study, scientists from NTU's Food Science and Technology Program also developed a process for producing the key reaction ingredient needed to cultivate the microalgal oil: pyruvic acid. It does this by fermenting organic waste products such as soy residue and fruit peels, which not only lowers production costs but also helps reduce food waste.

Prof Chen added: "Our solution is a three-pronged approach to solve three pressing problems. We harness the concept of circular economy by finding uses for potential waste products and feeding them back into the food chain. In this case, we support look to one of nature's most important processes, fermentation, to turn these organic matter into nutrient-rich solutions that could be used to cultivate algae, which not only reduces our reliance on palm oil but also keeps carbon out of the atmosphere.

Scientists will work on optimizing their extraction methods to improve yield and quality. The research team has attracted the interest of several partners from the food and beverage industry and may consider expanding operations within two years.

Because of the properties of the oils, the NTU team will investigate whether they can be added to plant-based meats to improve their texture and nutritional properties. They also hope to explore pharmaceutical and cosmetic uses in products like topical creams, lipsticks, and more.

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