GM fish food deal brings sustainable salmon a step closer to commercialization

Rothamsted Research, a United Kingdom plant science research institute, has signed a collaboration agreement with a bioscience company that brings the dream of fully sustainable farmed salmon a step closer to commercial reality.

In return for ongoing support, the collaboration agreement between Rothamsted Research and Yield10 Bioscience gives the company a two-year option to sign a licensing agreement to commercialize Rothamsted's pioneering omega-3 fish oils technology.

For several years scientists at Rothamsted Research have been working on a genetically-modified strain of the oilseed crop Camelina that can produce the healthy omega-3 fatty acids that are otherwise found only in wild-caught sea fish.

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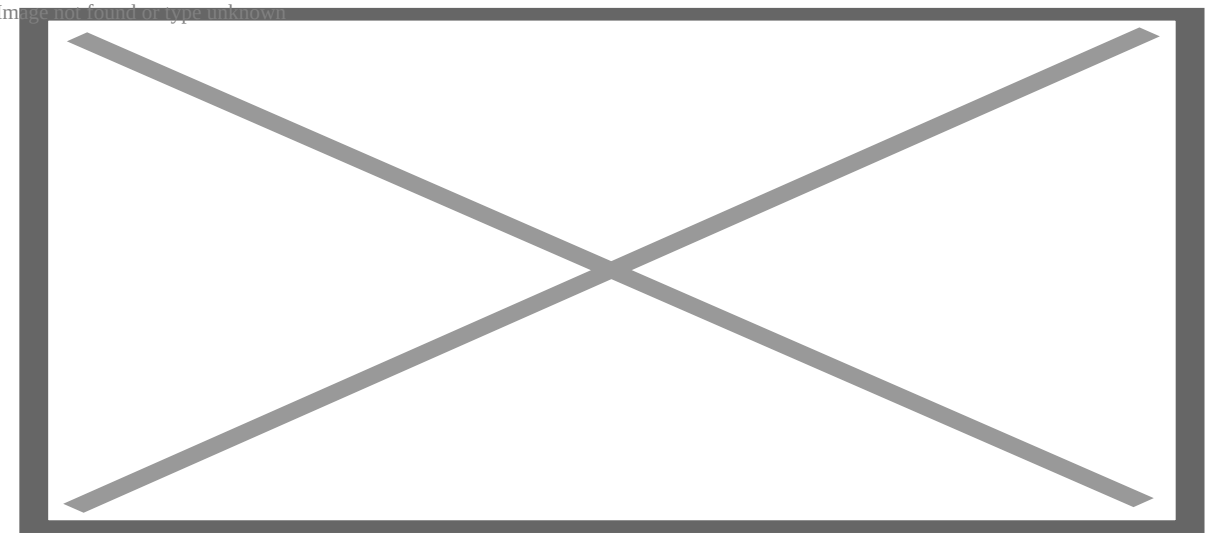

With catches of wild-caught fish already at unsustainable levels, the researchers hope that the GM Camelina can replace omega-3s in the fishmeal used to feed farmed salmon, enabling aquaculture to use more plant-based inputs grown on land and helping reduce overfishing.

Rothamsted's Prof. Johnathan Napier said: "Agriculture and plant biotechnology have the potential to radically transform aquaculture, by providing new sources of important nutrients such as omega-3 fish oils in a manner that is not constrained by limited natural resources."

He added: "The scalability of agriculture also means that supply can much better meet demand, helping aquaculture to further expand but without compromising either the environment or the nutritional quality of the fish."

"Yield10 is developing Camelina as a platform crop for the production of nutritional oils and PHA biomaterials and we believe there is significant market opportunity for omega-3 oils produced in Camelina and the technology developed by Prof. Napier and his team at Rothamsted is highly complementary to our

development efforts in Camelina," said Oliver Peoples, president and chief executive officer of Yield10 Bioscience.

"Under this collaboration, we will have the opportunity to further assess the omega-3 oil technology and ongoing progress by Rothamsted while Yield10 continues to focus on developing elite varieties of Camelina and establishing a strategic business plan to identify opportunities for commercial development for this high value oil," Peoples said.

Napier was lead author on a landmark paper published this month in the journal Nature Food, entitled "Agriculture can help aquaculture become greener," which outlined strategies for how aquaculture can deliver fish protein to a growing world population while staying within "planetary boundaries" of environmental sustainability.

In the paper the authors point out that due to overfishing and the depletion of marine biodiversity, only aquaculture has the potential to meet the needs of 10 billion people in 2050 while remaining within planetary boundaries. However, this will require aquaculture feeds to move away from fishmeal extracted from wild capture marine fisheries.

As co-author Dr. Monica Betancor, a fish nutritionist at the University of Strirling, said: "Fish feeds are becoming more plant-based and this impacts the nutritional profile of farmed fish. Plant biotechnology could offer a greener, sustainable future for aquaculture by providing beneficial omega-3 for fish and, in turn, boost levels in the human diet."

The Rothamsted team have already tested their Camelina-derived omega-3s on real farmed salmon, in a feeding trial conducted in collaboration with the University of Stirling in Scotland. The researchers found that the salmon fed with transgenic Camelina feed had double the levels of omega-3s as salmon fed conventional diets.

While omega-3 fats are found in many foods, the specific long-chain polyunsaturated fatty acids EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) are only found in marine-sourced oily fish. According to Napier and colleagues, EPA and DHA "play a vital role in neonatal and infant development as well as cardiovascular health and metabolic pathologies such as type-2 diabetes." Thus finding a sustainable source of these vital nutrients is a key challenge.

While two decades ago almost all fish feeds were sourced from wild fish, typically marine ingredients are typically only 25% of feeds used by salmon farms, with the other 75 percent coming from terrestrial plant-based sources. However, plants do not manufacture EPA and DHA, hence the need to import the necessary genes (which are sourced from marine algae) into the Camelina crop.

As the authors explain in Nature Food, "It is the unrivaled potential of agriculture to expand that has the greatest potential to help aquaculture — twinning the continued growth of the latter with the former can

help aquaculture to become greener and create a truly sustainable solution.”

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