

New aquaculture technology can help ease the global food crisis with 'enriched seaweed'

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Layout of the land-based, outdoor, aquaculture system as was stationed at the IOLR institute, Haifa, Israel. Credit: Doron Ashkenazi.

Researchers from Tel Aviv University and the Israel Oceanographic and Limnological Research Institute in Haifa have developed an innovative technology that enables the growth of "enriched seaweed" infused with nutrients, proteins, dietary fiber, and minerals for human and animal needs.

According to the researchers, the state-of-the-art technology significantly increases the [growth rate](#), protein levels, healthy carbohydrates, and minerals in the [seaweed](#)'s tissues—making the "enriched seaweed" a natural superfood with extremely high [nutritional value](#), which can be used in the future for the health food industry and to secure an unlimited food source.

The research was led by Ph.D. student Doron Ashkenazi, under the guidance of Prof. Avigdor Abelson from the School of Zoology, George S. Wise Faculty of Life Sciences at Tel Aviv University and Prof. Alvaro Israel of the Israel Oceanographic and Limnological Research Institute (IOLR) in Tel Shikmona, Haifa. The article was published in *Innovative Food Science & Emerging Technologies*.

Doron Ashkenazi explains that in the study, local species of the algae *Ulva*, *Gracilaria* and *Hypnea* were grown in close proximity to fish farming systems under different environmental conditions. The special conditions allowed the seaweed to flourish, and enabled a significant improvement in their nutritional value to the point of their becoming "enriched seaweed," which is a superfood. (The use of seaweed as a rich food source that meets all human nutritional needs is even reminiscent of the biblical manna that fed the Israelites in the desert). It will also be possible to use the enriched seaweed in an applied manner for other health industries, for example as [nutritional supplements](#) or as medicine, as well as in the cosmetics industry.



Naturally growing intertidal seaweeds. Credit: Doron Ashkenazi.

"Seaweed can be regarded as a natural superfood, more abundant in the necessary components of the human diet than other [food](#) sources," Ashkenazi adds. "Through the technological approach we developed, a farm owner or entrepreneur will be able to plan in advance a production line of seaweed rich in the substances in which they are interested, which can be used as health foods or nutritional supplements; for example, seaweed with a particularly high level of protein, seaweed rich in minerals such as iron, iodine, calcium, magnesium, and zinc, or in special pigments or anti-oxidants. The enriched seaweed can be used to

help populations suffering from malnutrition and nutritional deficiencies, for example disadvantaged populations around the world, as well as supplements to a vegetarian or vegan diet."

Moreover, unlike terrestrial agriculture, aquaculture, and in particular our proposed seaweed farming approach, does not require extensive land, fresh water or large amounts of fertilizer. It is environmentally friendly, and preserves nature and the ecological balance by reducing environmental risks. The [new methodology](#) in fact offers an ideal situation, of sustainable and clean agriculture. Today, integrated aquaculture is beginning to receive support from governments around the world due to its environmental benefits, which include the reduction of nutrient loads to coastal waters and of the emission of gases and carbon footprints. In this way, it contributes to combatting the climate crisis and global warming.



Underwater seaweed garden, Bat-Yam, Israel. Credit: Doron Ashkenazi.

Doron Ashkenazi concludes that "technologies of this type are undoubtedly a model for a better future for humanity, a future where humans live in idyll and in health in their environment."

More information: Doron Yehoshua Ashkenazi et al, Enrichment of nutritional compounds in seaweeds via abiotic stressors in integrated aquaculture, *Innovative Food Science & Emerging Technologies* (2022).

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