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Popular Article

From Ocean to Plate: Embracing Algae as a Healthy and Sustainable Food Source

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Abstract

Climate change and the world's growing population are putting tremendous strain on current agricultural and food production methods. There is a push for new and more sustainable food sources as a result of the need to feed almost 8 billion people with little environmental damage. One such innovative and ecological production method that is being researched more and more as a food and food ingredient is algae. algae are a diverse group of aquatic photosynthetic organisms that develop by eating carbon dioxide, light, and nutrients. They can be as large as giant kelp and seaweed, known as macroalgae, or as small as single-celled algae, known as microalgae. As a result of their remarkable resource efficiency, algae have emerged as a promising source of nutrient-rich biomass that has the potential to alleviate a number of the present problems associated with food production . Algae are rich in energy and a good supply of macro- and microelements, proteins, lipids, carbohydrates, and other physiologically active compounds. Additionally abundant in them are proteins, amino acids, polysaccharides, polyphenols, carotenoids, polyunsaturated fatty acids. The integration of algae into mainstream diets not only diversifies food options but also aligns with the principles of a sustainable and ethical food system. Thus, the need for continued research, education, and culinary exploration to fully integrate algae into global food cultures is something to be looked forward to. Embracing algae from ocean to plate represents a paradigm shift towards a healthier, more sustainable, and environmentally conscious approach to food production and consumption.

Keywords: Algae, Seaweed, Food, Ingredients, Nutrition, Sustainability, Environmental Impact.

INTRODUCTION

Over 820 million people worldwide lack access to sufficient food, and for the first time in many years, the number of undernourished individuals has been rising since 2015. There is increased pressure on how we produce and distribute food. To weather the crisis and continue to put food on billions of tables, producers and global supply chains face a special challenge. As a result, efforts are being made to create novel and sustainable food sources.

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Algae have showed a lot of promise as we look for healthful and sustainable food sources. These photosynthetic organisms, however often ignored and dismissed as nothing more than pond slime, are truly nutrient-dense powerhouses with the capacity to revolutionize our diets and address global food security concerns. Algae are a broad class of marine photosynthetic organisms that grow by consuming nutrients, light, and carbon dioxide. Macro-algae, or big kelp and seaweed, can reach enormous sizes, whereas microalgae, or single-celled algae, are smaller. Algae have become a viable source of nutrient-rich biomass with the potential to ease many of the current issues related to food production because of their exceptional resource efficiency. Algae are abundant in energy and a good source of proteins, lipids, carbohydrates, macro- and microelements, and other physiologically significant substances. The world of edible algae extends well beyond our favorite sushi roll to include varieties like chlorella, spirulina and sea moss. These aquatic micro-plants are a complete package of nutrients and deliver a host of health benefits.

3. THE ALGAL ADVANTAGE

Algae has changed our diets by being a part of the green revolution in culinary arts in recent years. What was originally believed to be pond slime has evolved into a superfood, challenging conventional wisdom about what belongs on our plates. Algae, the unsung heroes of our seas, are revolutionising the food industry by offering a sustainable, nutrient-dense alternative that is safe for the environment and human health. The nutritional profile of algae is remarkable, especially those types like seaweed, chlorella, and spirulina. Many food and food additives are extracted from algal species, like carrageenan, extracted from red algae, is a food additive which is used as a thickening and stabilizing agent in dairy products and desserts. A vegetarian substitute of gelatin; agar-agar, extracted from red algae is used as stabilizing and emulsifying agent in desserts and gels. Moreover, algae also provide us which natural food colorants and flavors.

A Package of Nutrients

Since algae include full protein (unlike plant food taken from the land), fiber, and occasionally significant levels of omega-3 fatty acids, they have excellent nutritional value. As a matter of fact, fish at the top of the food pyramid acquire their omega-3 acids from the microalgae that they eat at the base. These leafy miracles provide a sustainable substitute for conventional protein sources since they are loaded with vital vitamins, minerals (macro minerals like Na, K, Ca, Mg and trace elements like Fe, Zn, Mn, Cu), and amino acids. Some of the algal species are known to contain the most powerful water soluble antioxidants like polyphenols, phycobiliproteins and vitamins. Given that it contains most of the essential amino acids and vitamins, edible algae, such as, spirulima is recognised as a beneficial supplement to

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diets that are vegetarian or vegan.

Table1. Nutrient content in spirulina and chlorella

Nutrient (/100g)	Spirulina	Chlorella
Lipid	2.2 g	3 mg
Protein	63 g	60 mg
Carbohydrate	22 g	40 mg
Iron	58 g	240 mg
Calcium	1 g	33 mg
Magnesium	400 mg	274 mg
Zinc	3 mg	1.5 mg
Vitamin A	287% of the Daily Value (DV)	3% of the Daily Value (DV)
Riboflavin (B2)	71% of the DV	60% of the DV
Thiamine (B1)	32% of the DV	44% of the DV

Source: i) Algae as nutritional and functional food source, Wells *et al.*, 2017
ii) www.healthline.com/nutrition/chlorella-spirulina

Diverse Culinary Applications

The uses of algae in the kitchen are endless. Algae is becoming a more and more popular component in modern cuisine. The uses of algae in food are growing, providing a variety of ways to include them in regular meals. For example, algal oils extracted from certain algae species are rich in Polyunsaturated fatty acids (PUFAs) and omega-3 fatty acids, seaweed adds a distinct umami flavour to salads, soups, and snacks. To increase the nutritious value of smoothies, energy bars, or even pasta, add spirulina. As culinary experts and inventors work with algae, the possibilities for producing mouthwatering and nourishing meals seem endless. Many companies with are developing algae-based snacks such as chips, crackers and cookies. Not only they provide a different taste but also enough nutrition. In countries such as China, Japan, Korea, Iceland, Ireland, Chile and New Zealand algae are part of people's regular diet. Researchers have developed some algae fortified products which are easily available to common man.

Fig. Products developed using algae (adapted from Wells et al., 2017)

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Sustainable Farming Practices

The fact that algae has little environmental impact is one of the main factors contributing to its rising popularity as a food source. When compared to traditional crops, algal farming uses a great deal less land, water, and other resources, which makes it a sustainable solution for a globe facing resource scarcity and climate change. The ability of algae to sequester CO2 lends to its sustainability by helping to reduce the carbon footprint of its production. Additionally, algae can be produced on non-arable land using non-potable water (including brackish or seawater), which allows them to complement rather than compete with traditional agriculture. Algae offer a promising alternative for sustainable food production because they are a crop that can flourish in a variety of aquatic conditions.

CONCLUSION

Algae appear as a ray of hope as we work through the challenges of contemporary food production; they provide a nutrient-rich, sustainable, and adaptable answer. Algae's voyage from the ocean's depths to our plates is a monument to the inventive spirit of the culinary world, providing our bodies with vital nutrients and lessening the environmental impact of our meals. Accepting algae as a food source is a move towards a more nutrient-dense and sustainable future, not just a culinary experience.

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