

Novel food



Chlorella-algae – multi-functional food

Cultivated in photobioreactors.

Microalgae of the genus *Chlorella* can take up and accumulate bioavailable vitamin B12 synthesized by bacteria: vegan natural supplement for blood formation, nerve function and immune system.

Chlorella sp. – protein-rich green alga

The unicellular microalgae *Chlorella vulgaris* contain a 40-50% protein (including all essential amino acids) and is rich in antioxidant carotenoids (lutein, β -carotene), unsaturated fatty acids, dietary fiber, vitamins (C, K, B), minerals and trace elements. A special feature is the partially high content of vitamin B12. The coenzyme with the complex structure is not synthesized by the alga itself, but by associated bacteria.

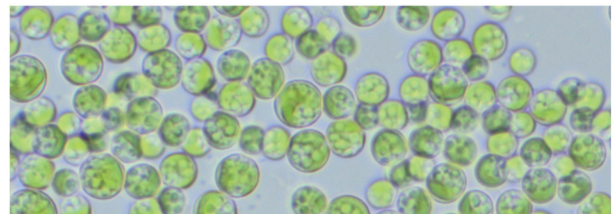
Natural vitamin B12 forms

Cobalamins (vitamin B12) are found almost exclusively in animal foods. Vitamin B12 is needed for blood formation, the nervous system and energy metabolism. Using a mass spectrometric analysis method established at the Anhalt University of Applied Sciences, it could be shown that *Chlorella vulgaris* contains predominantly bioavailable cobalamins, but hardly any of the non-bioactive pseudocobalamins. With an average cobalamin content of 1 $\mu\text{g/g}$ chlorella, the daily vitamin B12 requirement of an adult (3 $\mu\text{g/d}$) could be met with the consumption of 3 g chlorella biomass.

However, cobalamin contents in *Chlorella* products vary greatly, also depending on the cultivation conditions which need to be researched and optimized.

Conclusion

The alga *Chlorella vulgaris* is a promising plant source of vitamin B12. *Chlorella* algae can make an important contribution to a healthy diet and can be used in a variety of ways, such as smoothies, dips, algae cookies, film, bread and pasta.



Contact

Anhalt University of Applied Sciences
Competence Center Algal Biotechnology

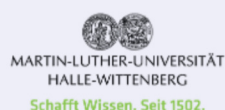
Prof. Dr. Carola Griehl

✉ carola.griehl@hs-anhalt.de

☎ +49 (0) 3496 67 2526

🌐 www.hs-anhalt.de

In Kooperation mit



Bioactive natural dyes | Real Ocean Blue Beer



Innovation in the beverage industry.

Biochemists and food technologists at Anhalt University of Applied Sciences have brewed a beer with an unusual color - subtly tart and refreshingly blue!

Clean label as a mega trend

The food industry is facing new structural challenges: Economic and ecological as well as social and technological mega-trends are influencing the way we look at our food. One of these trends is the social demand for so-called „free from“ foods, as more and more consumers reject the use of additives or flavorings. With the substitution of a colorant for a coloring food, the consumer's perception of naturalness increases.

Natural colors from algae

The Spirulina dye phycocyanin is found in nature exclusively in algae. Due to its health-protective (immunostimulant, anti-inflammatory, anti-carcinogenic) as well as intense coloring properties, this FDA-approved natural dye is increasingly used for blue coloring of food. It is produced by aqueous extraction from the blue-green alga *Arthrospira platensis*, which is grown in Köthen in GICON photobioreactors at pilot scale.

Guarantee of objective product quality

The matured result in Köthen is a beer - or rather an alcoholic beverage - that flows from the tap using the

algae pigment Spirulina blue. Researchers are currently working to ensure that objective product quality can be maintained as an indispensable prerequisite for a successful food product. In this context, product stability represents the central condition for quality. The guarantee of chemical-physical and microbiological stability as well as sensory stability form the basis for quality. The goal: a stable product. This still requires some experimentation, not only on the color, but also, for example, on the foam and its consistency.

Contact

Anhalt University of Applied Sciences
Competence Center Algal Biotechnology

Prof. Dr. Jean Titze

✉ jean.titze@hs-anhalt.de
☎ +49 (0) 3496 67 2561

Prof. Dr. Carola Griehl

✉ carola.griehl@hs-anhalt.de
☎ +49 (0) 3496 67 2526
🌐 www.hs-anhalt.de



Bioactive natural dyes



Carotenoids from microalgae

Biotechnologically produced.

Fat-soluble carotenoid pigments protect the algae cells from oxidative damage and extend the wavelength range of light that can be used for photosynthesis.

Yellow, orange, dark red and golden brown

Microalgae are versatile and almost ubiquitous phototrophic organisms whose species richness is as great as their spectrum of bioactive cellular constituents. These include the colored carotenoids, which manage the absorption of light quanta and can bind free radicals as protection against oxidative cell damage. They act as effective antioxidants, minimize UV-related damage and support the immune system.

Industrial cultivation

Some carotenoids are already industrially extracted from microalgae. They are approved as food colorants and are, furthermore, beneficial to health: The red astaxanthin (E 161 j) from *Haematococcus pluvialis* is a powerful antioxidant. The orange β -carotene (E 160 a) from *Dunaliella salina* is essential as a vitamin A precursor. The golden-brown fucoxanthin from *Phaeodactylum tricornutum* has antioxidant and anti-inflammatory effects. It stimulates fat burning and is traded as an active ingredient for reducing obesity. Fucoxanthin is

formed exclusively by marine macro- and microalgae. Due to its special molecular structure, it is not produced chemically, unlike other carotenoids.

Conclusion

Carotenoids from microalgae can be used in a variety of ways as natural colorants with health-promoting effects in foods, in juices, smoothies, oils, glazes, spreads, snacks and baked goods. Carotenoids are also used in food supplements, cosmetics, pharmaceuticals and animal feed.



Contact

Anhalt University of Applied Sciences
Competence Center Algal Biotechnology

Prof. Dr. Carola Griehl

✉ carola.griehl@hs-anhalt.de

☎ +49 (0) 3496 67 2526

🌐 www.hs-anhalt.de

In Kooperation mit



Novel food



Microalgae as a source of protein

Biotechnologically produced.

Microalgae are rich in proteins and essential amino acids: grown naturally and without genetic engineering.

Protein-rich species

More and more consumers are consciously looking for healthy and sustainably produced foods. The market for products with non-animal proteins is growing steadily. Microalgae can have a protein content of up to 60% of dry matter with high levels of nutritionally valuable essential amino acids. In addition, there are often other healthy ingredients such as polyunsaturated fatty acids, vitamins and carotenoids. In the EU, the following algae species have been approved for the use of the total biomass as foodstuffs: *Chlorella* sp. and *Tetraselmis chuii* (green algae), *Odontella aurita* (diatoms), *Arthrospira* sp. „Spirulina“ and *Aphanizomenon flos-aquae* „AFA algae“ (cyanobacteria). Of further algae species, extracts or oils are traded. The market for microalgae products is currently estimated at \$771.3 million worldwide and is expected to grow at a compound annual growth rate of up to 6.6% to reach \$1.1 billion by 2026 grow at an annual rate of up to 6.6% to \$1.1 billion.

Heterotrophic production

Some microalgae such as *Chlorella* can be cultivated with light and CO₂ as well as without light. The heterotrophic production without light and with glucose as carbon source results in a colorless-yellow protein-rich biomass („Golden Chlorella“). At Anhalt University of Applied Sciences, the application of algae proteins is investigated in a new research center for sustainable food production („Infonal“).

Conclusion

Microalgae can be used in many ways as an alternative source of protein, e.g. in smoothies, juices, pasta, baked goods, vegan fish sticks and sausage/meat products.

Contact

Anhalt University of Applied Sciences
Competence Center Algal Biotechnology

Prof. Dr. Carola Griehl

✉ carola.griehl@hs-anhalt.de

☎ +49 (0) 3496 67 2526

🌐 www.hs-anhalt.de

In Kooperation mit

