



## Ways to extract protein from Spirulina

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**Abstract:** Algae and microalgae are rich in biologically active compounds such as proteins, lipids, carotenoids, pigments, phenols and polysaccharides. This makes them a widely used natural material for the production of extracts, for food and food additives. Commonly used types of algae for food additives are mainly *Arthrospira*, *Spirulina*, *Hematococcus Pluvialis*, and *Ulva*. Microalgae are a good source of high-quality proteins, lipids, polysaccharides, vitamins and antioxidants. Based on this, we need to develop new versions of obtaining and extracting proteins, fats and carbohydrates.

**Keywords:** microalgae, protein, *Spirulina*[Sp], *Arthrospira*[Ar], food additive[FA], ultrasonic extractors[Ue], Hielscher ultrasonic, Ultrasonic Cavitation.

**Materials and methods.** *Spirulina* pigments such as phycocyanin are known as superfoods that promote health benefits due to their high content of antioxidants, vitamins and proteins. In order to produce highly concentrated additives such as powders and tablets, blue pigments must be extracted from *spirulina* algae. *Spirulina platensis* and *Spirulina maxima* are correctly called *Arthrospira platensis* and *Arthrospira maxima*. Both species were once classified in the genus *Spirulina* [Sp] and are still colloquially known by the name *spirulina* [Sp]. Although the introduction of two separate genera of *Arthrospira* [Ar] and *Spirulina* [Sp] is now generally accepted, the term *spirulina* [Sp] is often used as an umbrella term.

**Research results.** *Spirulina* [Sp] contains up to 70% concentrated vegetable protein. This means that in 100 g of sea grass almost twice as much as in 100 g of beef. And this is a complete protein, which contains all 8 essential amino acids that a person receives only with food. At the same time, it contains only 5-6% fat, as well as less methionine, lysine and cysteine, in contrast to animal protein. Algae in the composition of plant protein exceeds even legumes. *Spirulina* [Sp] has a loose mucoprotein cell membrane, which contributes to the rapid and complete absorption of the protein. Polyunsaturated fatty acids contained in *Spirulina* [Sp] are very important for the body. For example, gamma-linolenic acid (omega 6), which helps reduce inflammation and pain, is responsible for the health of the reproductive system. *Spirulina* [Sp] is a kind of cyanobacteria that get their energy through photosynthesis. They are the only photosynthetic prokaryotes capable of producing oxygen. The name cyanobacteria comes from the color of the bacteria. Because of their color, they are also called blue-green algae, although the term algae in modern usage is limited to eukaryotes. *Spirulina platensis* is a multifiltrous prokaryotic cyanobacterium that can be easily grown as a monoculture in open ponds or closed bioreactors. *Spirulina* [Sp] is a popular dietary



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supplement derived from marine microalgae biomass. Two types of spirulina [Sp] used for the preparation of protein and pigment additives are *Arthrospira [Ar] platensis* and *Arthrospira [Ar] maxima*. The extract extracted from these microalgae is rich in antioxidants, amino acids and vitamins. Thus, blue extract powder is added to juices, smoothies, drinks and gives them a beautiful intense blue color. In addition, spirulina [Sp] extract can be consumed in the form of tablets. Phycocyanin allophycocyanin and phycoerythrin are pigment-protein complexes from the family of light-harvesting phycobiliproteins, which are known for their intense light blue color. Phycocyanin is an accessory pigment of chlorophyll. Since all phycobiliproteins are water-soluble, they are not present in the membrane, instead phycobiliproteins are not bound as aggregates. Ultrasonic extraction [Ue] is used to release biologically active compounds from photographic material as well as tissues. For ultrasonic extraction [Ue] processes, intense ultrasonic waves are combined into a medium where the waves generate variable compression and expansion. During the compression and expansion cycles, vacuum bubbles are created that grow for several cycles until they can't absorb more energy, so they explode violently. This phenomenon is known as acoustic cavitation. The results of the study show that ultrasonic extraction [Ue] conditions optimized for protein yield include slightly elevated temperature and pressure. These factors contribute to mass transfer and make it possible to obtain 229% more proteins than the usual process without ultrasound (8.63 and 1.15 g / 100 g dry w). With 28.42 g of proteins obtained per 100 g of dry spirulina [Sp] biomass in the extract, a protein recovery rate of 50% was achieved in just 6 minutes in a continuous sonography process. Microscopic imaging shows that acoustic cavitation affects spirulina filaments by various mechanisms, such as fragmentation, sonoporation, detouration. These various effects make the extraction, release and soluble biologically active compounds of spirulina [Sp] easier and more effective, resulting in a high yield of high quality protein. As for the quality of ultrasonically extracted proteins, amino acids have not been degraded by ultrasound treatment, but they are present in greater quantities in the case of sonication compared to conventional extraction. Hielscher Ultrasonics' product portfolio covers the entire range of high-performance ultrasonic extractors from small to large scale. Additional accessories provide easy assembly of the most suitable ultrasonic device configuration for our process. The optimal ultrasound installation depends on the expected capacity, volume, raw materials, batch or wound process and timing. The reliability of Hielscher ultrasonic equipment allows you to work around the clock on heavy loads and in difficult conditions.

**Conclusion:** Studies say that algae can be used as a source of protein as a functional food with health benefits. Historically, coastal peoples all over the world eat edible algae, and today algae remains a habitual diet in many countries, especially in Asia. Indeed, recently many algae have been successfully added to food, ranging from sausage and cheese for pizza, to frozen meat products. Scientists drew attention to it as early as the 16th century, and in the 20-ies, various studies were conducted, which confirmed that the addition of algae to food can significantly improve health and lead to life. Gained fame due to its unique biochemical composition, this food product contains more than 2000 vitamins, minerals, amino acids. Spirulina [Sp] is available in the form of tablets, capsules and powder and is available in many foods.



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## Literature:

1. Voronin AV, Pervushkin SV, Shatalaev IF. Vliianie razlichnykh istochnikov ugleroda na rost kultury Spirulina platensis. Vestnik of Samara University. Natural Science. 2006;(2(42)):161–167. (In Russ.)
2. Vimer I, Weintraub IA. Fikobiliproteiny iz sine-zelenykh vodoroslei. Izvestiya. AN MSSR. 1987;(4):20–23.
3. Kedik SA, Yartsev EI, Panov AV. Spirulina – pishcha XXI veka. Moscow; 2010. (In Russ.)
4. Parchevskaya DS, Drobetskaya IV, Minyuk GS. System characteristics of Spirulina platensis (nordst.) geitler under industrial conditions. Ecologiya morya. 2002;60:71–74.
5. Pervushkin SV, Voronin AV, Sokhina AA. Spirulina biomass: research and prospects of use. Samara; 2004.
6. Pervushkin SV, Markova II, Kurkin VA, Zhelonkin NN. The development of the methodics of the quantitative determination of content of  $\beta$ -carotene and phycocyanin in the biomass of spirulina platensis. Fundamentalnye issledovaniia. 2013;(8–6):1426–1429.
7. Nikolayenko M.V., Son O.M., Tekut'eva L.A. Ispol'zovaniye mikrovdorosli Spirulina v pishevoy promishlennosti. 2013.
8. Usov A.I., Chijov O.S. Ximicheskiye issledovaniya vodorosley. Nauka, 1988.