



Nutritional Value of Microalgae Aquaculture

Microalgae are a rich source of essential nutrients for aquatic organisms:

- **Proteins:** They contain between 18% and 46% protein, and can reach up to 69% in some species⁷. These proteins are of high quality and contain essential amino acids².
- **Fatty acids:** They are rich in polyunsaturated fatty acids (PUFAs), especially EPA and DHA, crucial for various life stages of fish⁷¹.
- **Carbohydrates:** They provide an important source of energy for the growth of aquatic organisms¹.
- **Vitamins and Minerals:** Contain a variety of essential micronutrients³.
- **Antioxidants:** They have bioactive compounds with antioxidant properties³.

Effects on Growth and Performance

The inclusion of microalgae in aquaculture diets has shown positive effects:

- **Improved Growth:** A significant increase in weight gain and specific growth rate has been observed in species such as tilapia⁴.
- **Feed Efficiency:** Diets supplemented with microalgae improve feed conversion ratio (FCR) and feed efficiency (FE)².
- **Digestibility:** Microalgae can improve digestibility and nutrient availability².

Specific Applications

- **Shrimp Larvae:** Microalgae are essential in the nutrition of shrimp larvae¹.
- **Oyster Farming:** A mixed diet of microalgae outperforms monoalgal diets in the oyster hatchery and nursery phases¹.
- **Tilapia:** Partial or total substitution of fishmeal and fish oil by microalgae has shown promising results⁴.

Sustainability and Economy

Microalgae offer significant advantages in terms of sustainability:

- **Efficient Production:** They have a fast growth rate and require fewer resources than other crops³.
- **Versatility:** They can grow on a variety of substrates, including sewage⁷.
- **Economic Potential:** The global microalgae market is expected to grow from \$32.6 billion in 2017 to \$53.43 billion by 2026⁷.

In conclusion, microalgae represent a promising and sustainable alternative to traditional ingredients in aquaculture feed, offering significant nutritional, functional and economic benefits.

Citations:

1. <https://cdn.commercev3.net/cdn.arbico-organics.com/downloads/MicroalgaeinAquaculture.pdf>
2. <https://www.scielo.cl/pdf/lajar/v50n1/0718-560X-lajar-50-01-0088.pdf>
3. <https://bsmrau.edu.bd/seminar/wp-content/uploads/sites/318/2020/07/004-Joya-Saha-Reg-2019-05-5300.pdf>
4. <https://escholarship.org/content/qt4mp6w45x/qt4mp6w45x.pdf?t=rhfkhk>
5. <https://riuma.uma.es/xmlui/bitstream/handle/10630/31439/fishes-08-00409-v3.pdf?sequence=1>
6. <https://austinpublishinggroup.com/biology/fulltext/ab-v4-id1029.pdf>
7. https://lifebioencapsulation.com/Publicaciones/2024-Aquaculture-590_741015.pdf
8. https://www.researchgate.net/publication/363265027_Microalgae_and_Fish_Nutrition
9. https://www.researchgate.net/publication/377177100_Role_of_Dietary_Microalgae_on_Fish_Health_and_Fillet_Quality_Recent_Insights_and_Future_Prospects
10. https://www.researchgate.net/publication/221923309_Nutritional_Value_and_Uses_of_Microalgae_in_Aquaculture
11. <https://www.mdpi.com/2410-3888/9/1/26>
12. <https://www.zoologyjournals.com/assets/archives/2024/vol9issue2/9015.pdf>
13. <https://digital.csic.es/bitstream/10261/338334/1/fishes-08-00532-v2.pdf>
14. <https://www.semanticscholar.org/paper/Nutritional-Value-and-Use-of-Microalgae-in-Brown/f4b3c9b748db721a2d770f5588a752822cd593cb>
15. <https://www.frontiersin.org/journals/bioengineering-and-biotechnology/articles/10.3389/fbioe.2023.1151440/pdf>
16. <https://pdfs.semanticscholar.org/360c/b83659fde45e6ef601f9bbe7f172cbd4193f.pdf>
17. <https://nutricionacuicola.uanl.mx/index.php/acu/article/view/242>
18. https://ruc.udc.es/dspace/bitstream/handle/2183/13942/Herrero_Concepcion_1986_Marine_microalgae_source_minerals_fish_diets.pdf?sequence=2&isAllowed=y
19. <https://publications.jrc.ec.europa.eu/repository/bitstream/JRC85709/final%20version%20online%20ipts%20jrc%2085709.pdf>
20. <https://www.nature.com/articles/s41598-020-75289-x>

USE OF MICROALGAE IN SHRIMP FARMING

ADVANTAGES

Improving Water Quality

Microalgae have a positive impact on the quality of culture water:

- They reduce the levels of ammonia, suspended solids, orthophosphate, nitrite and nitrate¹.
- They help regulate pH levels and increase dissolved oxygen during day¹.
- They efficiently remove nitrogen and phosphorus from the crop water².

Pathogen Control

- They suppress the concentration of *Vibrios* in the tank sediment and surrounding water, keeping shrimp healthier¹.
- They produce extracellular compounds such as tropodithietic acid that inhibit the growth of harmful pathogens¹.

Improved Growth and Performance

Shrimp farmed with microalgae show:

- Higher average weight gain and growth rate¹.
- Lower feed conversion ratio (FCR)¹.
- Increased overall productivity by up to 25% compared to control groups¹.

Nutrition and Food

- They serve as a natural food source rich in lipids, minerals and essential amino acids¹.
- They can partially replace fishmeal in aquaculture diets³.

Environmental Sustainability

- Reduce pollution when treating aquaculture wastewater¹.
- They minimize water discharge, reducing emissions of pollutants such as total phosphorus, phosphate, total organic carbon, ammonium, and chemical oxygen demand².

Resource Efficiency

- They improve the efficiency in the use of phosphorus through assimilatory and dissimilatory processes².
- They facilitate water recirculation, making the system more sustainable².

In conclusion, incorporating microalgae into shrimp farming not only improves shrimp growth and health, but also contributes significantly to the environmental and economic sustainability of aquaculture.

Citations:

1. <https://thefishsite.com/articles/microalgae-boosts-water-quality-and-finishing-yield-in-whiteleg-shrimp>
2. <https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2023.1163640/full>
3. <https://www.globalseafood.org/advocate/effect-of-microalgae-scenedesmus-on-pacific-white-shrimp-and-nile-tilapia-in-a-biofloc-environment/>
4. <https://typeset.io/questions/what-is-the-role-of-microalgae-in-shrimp-cultivation-4zaxn7bn5q>
5. https://www.researchgate.net/publication/221923309_Nutritional_Value_and_Uses_of_Microalgae_in_Aquaculture
6. <https://www.mdpi.com/2076-3417/9/11/2377>
7. <https://eurofish.dk/microalgae-are-gaining-in-importance-for-aquaculture/>