

## **SPIRULINA: Complete food package for present and future generation**

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### **Abstract**

Edible blue-green algae, including Nostoc, Spirulina, and Aphanizomenon species have been used for food for thousands of years. Spirulina is a type of blue-green algae that grows in both salt and fresh water. It may be one of the most nutrient-dense foods on earth. Spirulina are multicellular and filamentous blue green algae that has gained considerable popularity in the health food industry and increasingly as a protein and vitamin supplement to aquacultures diets. It is also known as “Wonder Gift of Nature and The Future Nutritional Food” for human beings. Spirulina contains 55 to 70 percent of protein and rich in all the nutrients needed for daily growth. Spirulina are simple prokaryote share features with plants, because of the ability of Photosynthesis, share features with primitive bacteria because lack a plant cell wall also characteristics of the animal as contain on cellular membrane complex sugars similar to glycogen.

**Key words** Spirulina, Health benefit, nutrients and Protein content.

### **Introduction**

Spirulina is a type of blue-green algae that is rich in nutrients, including B vitamins, beta carotene, and vitamin E. It is mainly used for both as a dietary supplement and as a

whole food. Spirulina is a good source of vegan protein and also have other health benefits.



There is better scope in microbial protein or single cell protein (SCP), a new source of protein independent of agriculture. SCP (dried cells of microorganisms such as bacteria, fungi, yeasts and algae) having properties like; fast growth rate; high protein content (43-85%) compared to field crops; require less water, land and independent of climate; grow on wastewater; can be genetically modified for desirable characters such as amino acid composition and temperature tolerance. Spirulina has been used as a complementary dietary ingredient of feed for fish, shrimp and poultry and increasingly as a protein and vitamin supplement to aqua feeds.

Commonly three spirulina species are grown commercially

- *Arthrospira fusiformis*
- *Arthrospira planteris*
- *Arthrospira maxima*

### Quantity and consumption

Daily uptake of spirulina - 3,000 mg per day better for overall health.

Spirulina is sold in market as in powder form also available in capsules, tablets, and liquids.

The appropriate dose can vary based on your age, sex, medical history, and other factors. As a general rule, never exceed the dosage on the product label.

### Nutritive value of spirulina

100 gm spirulina contains

Total Calories (Kcal)	333
Total Fat (g)	5
Protein (g)	67
Total Carbohydrate	16
Fiber (g)	7
Moisture (g)	5



**Spirulina rich in nutrient content as**

A single tablespoon (7 grams) of dried spirulina powder contains:

- **Protein:** 4 grams
- **Vitamin B1 (thiamine):** 11% of the

RDA

- **Vitamin B2 (riboflavin):** 15% of the RDA

(It is often claimed that spirulina contains vitamin B12, but has pseudovitamin B12, which has not effective for humans)

- **Vitamin B3 (niacin):** 4% of the RDA
- **Copper:** 21% of the RDA
- **Iron:** 11% of the RDA
- It also contains decent amounts of magnesium, potassium, manganese and small amounts of almost every other nutrient that our body required. The same amount holds only 20 calories and 1.7 grams of digestible carbs.

A tablespoon of spirulina provides a small amount of fat - around 1 gram — including both omega-6 and omega-3 fatty acids in an approximately 1.5–1.0 ratio.

The protein content in spirulina is excellent — compare to eggs because it gives all the essential amino acids

### Medicinal uses of Spirulina

- ✓ Spirulina contains compounds that is beneficial for overall health, including antioxidants, minerals, chlorophyll, and phycocyanin (the pigment which gives the algae its blue color).
- ✓ Spirulina is a good amount of antioxidants and its main active component is phycocyanin. powerful antioxidant and anti-inflammatory properties that is also responsible for unique blue-green color in spirulina.
- ✓ Spirulina has performed better in popular diabetes drugs, including Metformin
- ✓ Phycocyanin is effective against free radicals and reduce inflammatory signaling molecules production
- ✓ Spirulina is a popular supplements and alternative treatment for symptoms of allergic rhinitis, and there is evidence that it can be effective
- ✓ Spirulina provide multiple exercise benefits, including enhanced endurance and increased muscle strength.
- ✓ Spirulina lower total cholesterol, “bad” LDL cholesterol and triglycerides, while increase “good” HDL cholesterol.
- ✓ Fatty structures in human body are susceptible to lipid peroxidation that cause many serious diseases due to oxidative damage.
- ✓ The antioxidants in spirulina effective in reducing lipid peroxidation in both humans and animals
- ✓ Spirulina having anti-cancer properties and this is effective against a type of precancerous lesion of the mouth called OSMF / oral cancer.
- ✓ Spirulina improve the levels of blood lipids, reduce blood pressure, suppress oxidation and lower blood sugar. A dose of 4.5 grams per day has been shown to reduce blood pressure in individuals with normal levels, this is due to an increased production of nitric oxide that is a signaling molecule which helps blood vessels relax and dilate.

### Precaution during consuming spirulina

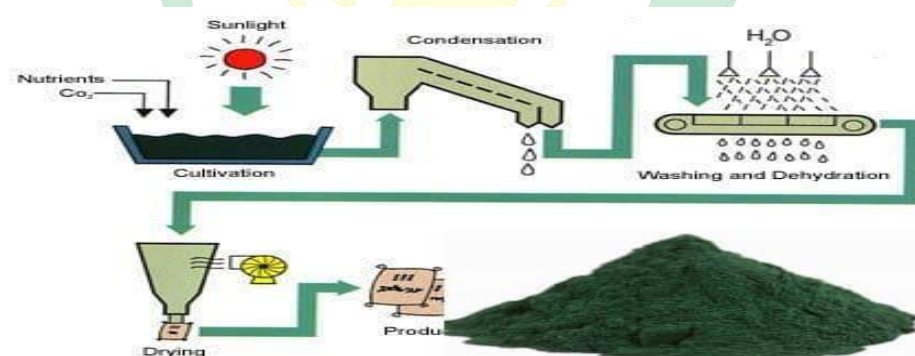
- ✓ Spirulina is generally beneficial for humans but sometimes, it causes muscle pain, sweating, headaches and insomnia in some people.

- ✓ Spirulina stimulate the immune system so spirulina consumption should be avoided by those people autoimmune diseases (an overactive immune system attacks healthy tissues) such as multiple sclerosis, rheumatoid arthritis
- ✓ Spirulina should be avoided in people suffering from immunosuppressive drugs like Enbrel (etanercept), Cellcept (mycophenolate) and Humira (adalimumab) because these drugs cure diseases by blocking the immune system in specific ways.
- ✓ Spirulina because it is rich in amino acidssould be avoided by those people suffering from a disorder called phenylketonuria, who are unable to process a certain amino acid,
- ✓ Safety uptake of spirulina with advice of doctors in pregnant, breastfeeding, or planning to get pregnant.

### Methods of spirulina growing

#### ❖ Grow-out culture

In this system, water is constantly circulating so that the nutrients in the water get to algae and prevent the algae from setting to the bottom of the tank. It's economically made profitable. This is also known as raceways flow-through system.



#### ❖ Mother or pure culture

Healthy mother algae should be determining a good quality output and high yield. Because it's necessary to avoiding contamination or mix with other microalgae.

### Growing factor

- **PH-** The best range of PH is 10.5 to 11 for optimum growth, PH below 10 leads to contamination of other microalgae or above 11 leads to chemical changes.
- **Temperature** - Optimal temperature for spirulina growth is ranges from 30 to 35°C

- **Transparency** –The optimum transparency range is between 20 to 25cm. Transparency should be check daily because it helps in calculate algae density in tanks.

### Harvest of Spirulina

The first harvest should be started in 15 to 20 days, then regularly harvest by day today.

Harvesting takes in morning 6 to 8 am suitable time for high yield. Because the presense of sunlight algae started in reproduction for cell fusion that leads to reduction cell size.

### Yield

Yield is varies from space, density, growing factors and other environmental factors. Generally on an average 15kg is obtained from wet weight and 1kg from dry weight.

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