



## A Review On "*Spirulina (Arthrospira) Blue Green Alga*"

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### ABSTRACT -

The blue-green algae spirulina, also known as arthrospira, sprang to fame after NASA employed it effectively as a food supplement for astronauts on space missions. About 60% of the protein in spirulina comes from 12 different vitamins and at least 8 minerals. As a result, spirulina is a superfood and offers a wide range of advantages. It has the capacity to regulate immunological processes and demonstrates anti-inflammatory characteristics by preventing mast cells from releasing histamine. Several randomised controlled trials and systematic reviews have been conducted to examine the effectiveness and potential clinical uses of spirulina in the treatment of various diseases. The results of these studies suggest that this alga may improve a number of symptoms and may even have anticancer, antiviral, and antiallergic properties.

potential and current clinical applications.

### KEYWORDS -

Spirulina Arthrospira platensis, Nutritional use, Dietary supplement.

### INTRODUCTION -

Spirulina Arthrospira platensis is a unicellular microalgae which grows in freshwater, in salt water, as well as in brackish bodies of water. It also grows in a highly alkaline environment of pH 10-12. Such conditions currently exist in certain lakes in sub-Saharan Africa and formerly in Mexico and Central America.

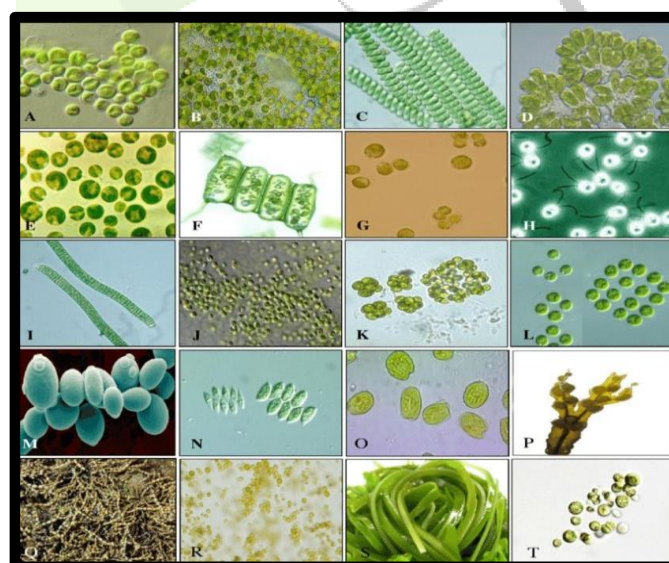


*Fig 1 : Microscopic view of spirulina*

## **ROLE OF SPIRULINA \_**

- 1) National government
- 2) intergovernmental organizations to re-evaluate the potential of spirulina to fulfill both their own food security needs as well as a tool for their overseas development and emergency response efforts. International organisations (s) working with Spirulina Should Consider Preparing a practical guide to small -scale Spirulina production that could be used as a basic for extension and development methodologies

## **SCIENTIFIC CLASSIFICATION OF SPIRULINA -**



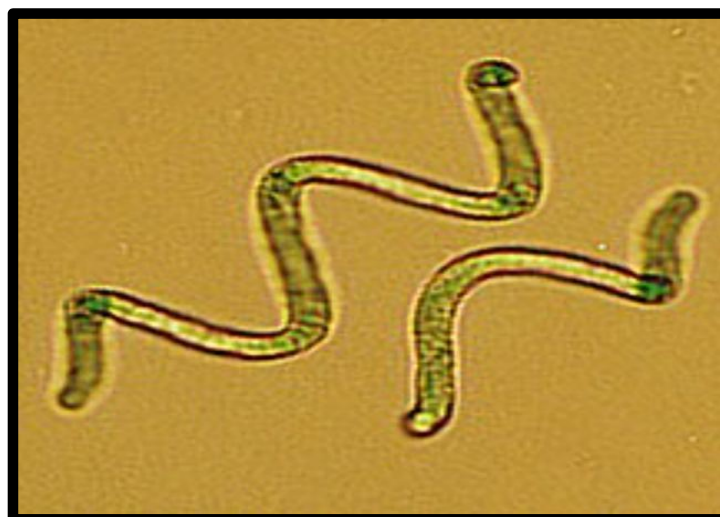
*Fig 2 : classification of spirulina*

Domain	Bacteria
Kingdom	Archaeplastida
Division	Cyanobacteria
Class	Cyanophyceae
Order	Oscillatoriales
Family	Pseudanabaenaceae
Subfamily	Spirulinoideae
Genus	Spirulina
Scientific name	Arthrospira

### TAXONOMY OF SPIRULINA -

The common name, spirulina, refers to the dried biomass of *Arthrospira platensis*, which belongs to the oxygenic photosynthetic bacteria that cover the groups Cyanobacteria and Prochlorales. These photosynthetic organisms were first considered to be algae, a very large and diverse group of eukaryotic organisms, until 1962 when they were reclassified as prokaryotes and named Cyanobacteria.

Scientifically, quite a distinction exists between the *Spirulina* and *Arthrospira* genera. Stizenberger, in 1852, gave the name *Arthrospira* based on the presence of septa, its helical form, and its multicellular structure, and Gomont, in 1892, confirmed the aseptate form of the genus *Spirulina*.

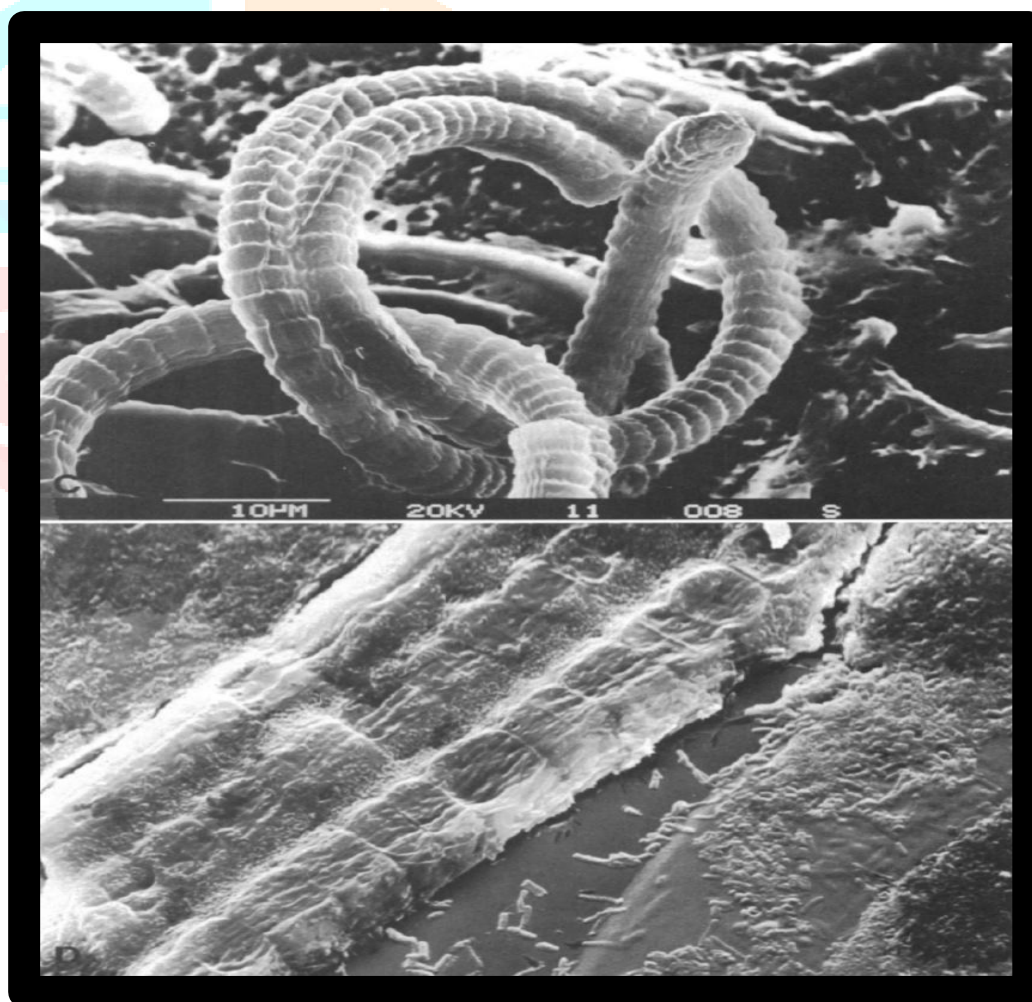


*Fig 3 : Taxonomy of Spirulina*

## MORPHOLOGY OF SPIRULINA -

Spirulina is a multicellular, filamentous, blue-green symbiotic microalga that works with symbiotic bacteria to fix nitrogen from the atmosphere. Spirulina can be formed like a rod or a disc. The blue pigment phycocyanin serves as their principal photosynthetic pigment. Additionally, these bacteria include carotenoids and chlorophyll a. Some of them have the phycoerythrin pigment, which gives the bacteria a red or pink colour. Spirulina are autotrophic because they photosynthesize. Spirulina divides through binary fission.

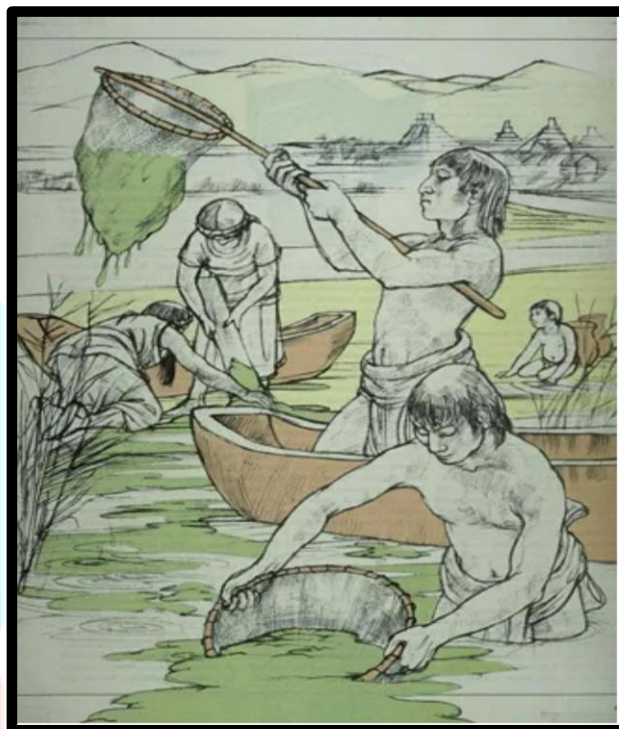
Only a liquid environment or culture medium can sustain the trichomes' helical form, which is distinctive to the genus. The helical structure of the filaments and the presence of gas-filled vacuoles in the cells cause floating mats. The trichomes are 3 to 50  $\mu$ m wide and 50 to 500  $\mu$ m long.



**Fig 4 :** Morphology of Spirulina(Arthrospira)

## HISTORY \_

German algal scientist Dr. Darwin made the discovery of the spiral-shaped algae and gave it the name spirulina. The cyanobacteria class was discovered by uncited Mexicans in the 16th century, and the seaweed spirulina, a blue-green algal biomass, has been consumed regularly ever since.

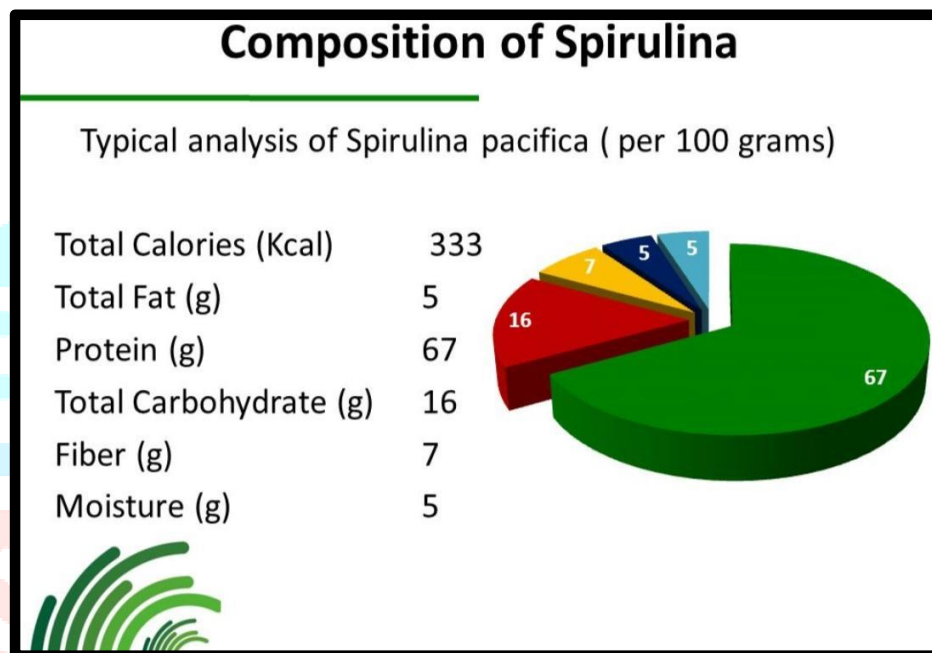


**Fig 5 :** Aztecs harvesting Spirulina for Food

Since it was harvested from Lake Texcoco and sold as cakes, spirulina is known to have been an important food source for the Aztecs in 16th-century Mexico. This information comes from one of Cortés' soldiers. Tecuitlatl, which translates as the stone's feces, was the Aztec name for it. French researchers discovered an abundance of spirulina at the lake in the 1960s, but there is no evidence that it was used there as a staple food source after the 16th century. Early in the 1970s, a large-scale Spirulina production facility was built, garnering interest on a global scale.

**COMPOSITION\_**

Total calories (kcal)	333 (Kcal)
Total fat (g)	5 (g)
Protine (g)	67 (g)
Total Carbohydrate (g)	16 (g)
Fiber (g)	7 (g)
Moisture (g)	5(g)



**Fig 6 :** composition of spirulina

**VITAMINS PRESENT IN SPIRULINA \_**

Vitamin (A) (IU)	375,000 (IU)
Vitamin B12 (ug)	300 (ug)
Calcium (mg)	333 (mg)
Iron (mg)	217(mg)
Total carotenoids (mg)	500(mg)

## **BIOCHEMICAL COMPOSITION -**

### **1)Protein**

Spirulina contains surprisingly high measures of protein, somewhere in the range of 55 and 70 percent by dry weight, contingent on the source . It is a finished protein, containing all fundamental amino acids, however with diminished measures of methionine, cystine, and lysine, when contrasted with standard proteins like that from meat, eggs, or milk; it is, nonetheless, better than all standard plant protein, for example, that from meat, eggs, or milk, it is , Notwithstanding, better than all standard plant protein ,like that from vegetables.

### **2)Vitamins:-**

Spirulina contains vitamin B1 (thiamine), B2 (riboflavin), B3 (nicotinamide), B6 (pyridoxine), B9 (folic corrosive), B12 (cyanocobalamin), L-ascorbic acid, vitamin D and vitamin E.

### **3)Minerals-**

Spirulina is a rich wellspring of potassium, and furthermore contains calcium, chromium, copper, iron, magnesium, manganese, phosphorus, selenium, sodium and zinc.

### **4)Essential unsaturated fats-**

Spirulina has a high measure of polyunsaturated unsaturated fats (PUFAs), 1.5-2.0 percent of 5-6 percent absolute lipid. Specifically spirulina is rich in  $\gamma$ -linolenic corrosive (36% of absolute PUFAs), and additionally gives  $\gamma$ -linolenic corrosive (ALA), linoleic corrosive (LA, 36% of aggregate ), stearidonic corrosive (SDA), eicosapentaenoic corrosive (EPA), docosahexaenoic corrosive (DHA) and arachidonic corrosive (AA).

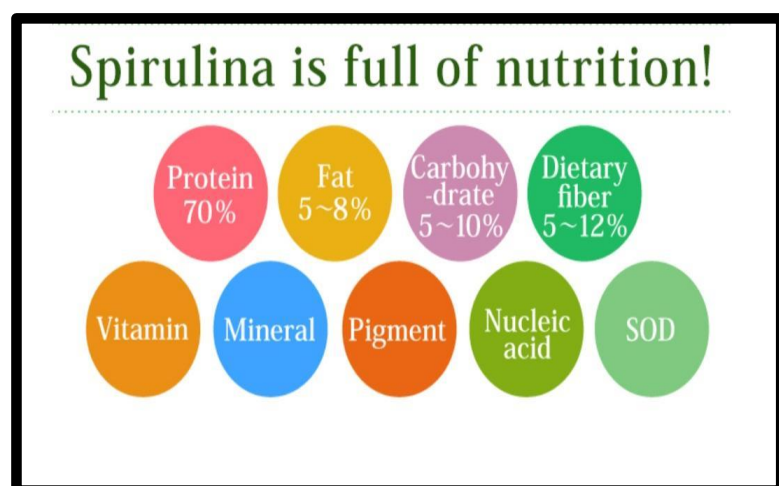
### **5) Photosynthetic pigments-**

Spirulina contains many colors including chlorophyll a, xanthophyll, beta-carotene, echinenone, myxoxanthophyll, zeaxanthin, canthaxanthin, diatoxanthin, 3-hydroxyechinenone, beta-cryptoxanthin, oscillaxanthin, in addition to the phycobiliproteins c-phycoyanin and allophycocyanin.

Nutrient Levels:

basic nutrients such as amino acids, essential fatty acids, vitamins and minerals, Spirulina supplies many phytonutrients that are lacking in most of our diets.

Moreover, Spirulina supplies common nutrients at high levels; comparing Spirulina with other foods shows it unusual nutrient profile.



*Fig 7: Nutrient levels of spirulina*

## UNITED NATIONS AND NASA INTEREST -

Spirulina or Arthrospira is a blue-green alga that became well known after it was effectively utilized by NASA as a dietary enhancement for space travelers on space missions.

### Why NASA Supports Spirulina As Space Food?

Give it an idea that there is a centuries-old Super-food that has as of late been recognized as a fantastic decision of being considered as space food! Spirulina basically upholds generally speaking great wellbeing, and is an incredibly protected supplement to be consumed by individuals of practically all age gatherings and different backgrounds.

## SPIRULINA FARMING CONDITIONS FOR GROWTH

Spirulina must be grown at a minimum temperature of 20°C, although it can also thrive at temperatures as high as 37°C. Spirulina may grow without soil if it is grown in water. For spirulina to thrive, it needs chemicals and minerals, and the pH of the growth medium should be between 8 and 11. Spirulina is often grown in a container or an artificial pool. Spirulina requires shade during its early growing stages, thus it is given a temporary cover. Spirulina grows more slowly when there is less sunlight and less concentration in the solution. Shallow water is ideal for cultivating spirulina in lakes or other containers.





*Fig 9 : Spirulina farming*

Rain is thought to dilute the culture and change the pH; dust and sand tangle in the spirulina and make it heavy, causing it to sink to the bottom; flies and insects should be avoided; and direct sunlight at the beginning of growth must be avoided. The foregoing issues might all be resolved by a green house setup since spirulina reduces evaporation and cross-contamination. farming. The temperature rises as a result, and cultivation of microalgae.

### **MEDIUM OF GROWTH FOR SPIRULINA FARMING\_**

Spirulina is grown in a culture media that is composed of water and nutrients. Since Spirulina doesn't have any competitors at the pH level maintained in the pond, any type of water can be used, including brackish water, rainwater, fresh drinking water, etc. At this pH level, neither parasites nor germs can survive in the medium. Heavy metals should not be present in the water used to grow spirulina because if they are, the spirulina will absorb them. The fertilizers required for spirulina farming are:

Sodium bicarbonate

- Citric acid
- Urea
- Potassium nitrate
- Sodium chloride
- Potassium dehydrogenate phosphate
- Iron sulfate
- Magnesium sulfate

Large scale cultivation needs calcium in the form of lime, gypsum or calcium chloride

## USES OF SPIRULINA -

1. Rich in many nutrient:

A single tablespoon (tbsp.), or 7 g, of dried spirulina powder contains:

- Protein: 4 g
- Thiamin: 14% of the Daily Value
- Riboflavin: 20% of the DV
- Niacin: 6% of the DV
- Copper: 47% of the DV
- Iron: 11% of the DV

2. Spirulina have anti-cancer properties:

decrease the volume of cancer cells in the body by activating a group of immune cells. An earlier human clinical study also has shown that spirulina is effective in the prevention of oral cancer.

3. it support blood sugar control

4. Spirulina used to improve muscle strength\_

Spirulina, its high total protein content (it contains the 8 amino acids necessary for the formation of a complete protein) and increase muscle strength.

5. effective against anemia

6. powerful antioxidant and anti-inflammatory properties

7. Enhance the energy

8. Improve body functions

## SIDE-EFFECTS OF SPIRULINA

Some minor side effects of spirulina *Arthrospira* may include following \_

- nausea
- insomnia
- headaches
- Vomiting

## CONCLUSION -

Spirulina is highly nutritious and shows great diversity and higher concentrations of nutrients compared to other food sources.

The present review concludes that the Spirulina is used as a potential health food in human diet and used in food industry. It is a super food and a best dietary source for the malnutrition. It lowers celesten, suppresses fatty accumulation in the liver, prevents tumor formation, enhances the immune system and protects kidneys. *S. platensis* are known to contain an excellent source of minerals, especially calcium and potassium, proteins, carbohydrates, essential fatty acids, vitamins, minerals, carotenes, chlorophyll a and phycocyanin. Therefore Spirulina could be used as medicine for diseases as well as daily nutrient source.

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