

Spirulina : Health Food for Complete Nutrition

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Abstract

Spirulina is a unique health food contains all the things required for proper growth and development of human being. Spirulina has also been classified under the umbrella of single cell protein (SCP) which are grown in large scale for use as protein source for human or animal consumption. Without any adverse effect but it have some demerits also. Sometimes it spreads unpleasant and bitter taste. However, new technologies have been developed to overcome these problems. But overall it is a best food for human consumption.

Keywords – Spirulina, functional foods, food additives, medicinal value, food colouring.

Spirulina is a blue green algae belonging to the class cyanophyceae and family Oscillatoriaceae. It is one of aquatic microflora having unique nutrient composition with antioxidant properties. Spirulina comes under single cell protein because it is used as protein source for human consumption. In 1974, UN declared spirulina as “the best food for tomorrow” at World Food Conference and World Population Conference”. Research conducted on Spirulina by the World Health Organization and Scientists all over the World has confirmed that it has a blend of nutrients that no single plant source can provide. The presence of valuable enzymes like superoxide dismutase, pigments like beta carotene and vitamins like B2, B6, B12, C,D,E,F. and H helps to protect the human body against free radicals formed due to stress, exposure to toxic chemicals, drugs and poor diets. Free radicals have many harmful effects like illness, cancer and faster aging: Spirulina being the only dietary source of gamma linolenic acid other than mother’s milk, also protects from atherosclerosis. It’s most popular species spirulina maxima is used as human consumption since centuries. The biochemical composition of spirulina maxima have been studied by Sen and

Sarkar². Which is given in Table 1 and Table 2 shows the net protein utilization.

The protein content of spirulina (61.70%) is higher than of soybean (47.03%) or mushroom (40.00%). All the essential amino acids are present in spirulina. It is a good source of water soluble vitamins and essential fatty acids. The biological value of spirulina protein is higher than some common foods used in our daily life. It’s protein has 85-95 per cent digestibility¹.

Uses of Spirulina:

Spirulina has innumerable uses, not only as a health food, but also in various other fields which can be given as follows:

Biochemicals: Spirulina is being used as a substitute for animal products used in raising serum free mammalian cell lines and for fluorescent staining of microscopic samples.

Pollution Control: Spirulina can be used as a tool to reduce pollution from waste waters.

Dietary supplement: It can be used as dietary supplement of fight against malnutrition and starvation. For athletes, spirulina powder can be supplemented with the food at the rate

of 3 per cent in wheat flour and wheat nodules. In rice noddles it can be fortified with protein powder containing 10 per cent spirulina and 90 per cent soya/egg. It can also be incorporated in lactational feed.

Cosmetics: The effects of spirulina on the nourishment of skin have proved the way for cosmetic formulations. It is now used for the production of lipstick, eye shadow, eyeliner, antipimple, antiwrinkle cream, lotion and facemask.

Food colouring: Spirulina has various colour pigments. It can be used for imparting natural colour to the food products like sweets, ice-creams (Phycocyanin-blue and Beta-carotene-yellow).

Biotransformation: It is being used in biotransformation from codeine to morphine.

Co-cultivation: It helps in increasing yield of higher plants with lower inputs by increasing the accumulation of photo synthates.

Medicinal value: Spirulina is very much effective in arthritis and reduce the level of breast and uterus cancer. It control the blood sugar and blood cholesterol level and minimize the risk of heart attack. It prevents premature aging and old age related problems. It is cent percent vegetarian and free from any side effects.

Important Ingredients: Spirulina has various important ingredients like gamma linolenic acid (GLA), antioxidants, Phycocyanin, Beta-carotene, calcium, iron, vitamin B complex and proteins. GLA is used to control cholesterol level and keeps the skin tight and glossy. Phycocyanin is strengthens the body immunity while antioxidant retards the rate of becoming old. Iron is used in the synthesis of haemoglobin and prevent the anaemia.

mia.

Spirulina as a health food and nutritional supplement for a human beings has unlimited scope in the future. It has a great demand in several countries all over the world. It is a wonder gift of nature and care must be taken to harness its potential to the maximum extent for better tomorrow. It possesses a unique enzyme superoxide dismutase (SOD), the free radicle scavenger. The 10000-37000 units/kg SOD content is vital in combating free radicle related injuries like atherosclerosis, diabetes, arthritis, cataract, ageing, cancer and wrinkles, apart from protection due to sun radiation, smoking, chemical and emotional stress. Long and Zuan³ observed the material base and present situation of research and development in spirulina platensis functional foods. The summary reports material bases and the present situation of research in spirulina platensis functional foods including edible fibre, vitamins, mineral and trace elements, amino acids. Shiraishi and Tabuse⁴ observed on The A_{pl}I restriction-modification system in an edible cyanobacterium, *Arthrospira* (Spirulina) platensis NIES-39, recognizes the nucleotide sequence 5'-CTGCAG-3'. The protein produced from the putative type II restriction enzyme gene NIES39_K04640 exhibited an endonuclease activity that cleaved DNA within the sequence 5'-CTGCAG-3' between the A at the fifth position and the G at the sixth position. Hosseini, *et al.*⁵ studied on Nutritional and medical applications of spirulina microalgae. They found that Spirulina has several pharmacological activities such as antimicrobial (including antiviral and antibacterial), anticancer, metalloprotective (prevention of heavy-metal poisoning against Cd, Pb, Fe, Hg), as well as immunostimulant and antioxidant effects due to its rich content of protein, polysaccharide, lipid, essential amino and fatty acids, dietary minerals and vitamins.

Table 1: Biochemical composition of Spirulina (on dry cot basis)²

Sl.No.	Ingredients	Spirulina
1	Protein g/100g	48-61
Amino acids (g/16gN)		
2	Alanine	5.0-6.1
3	Arginine	4.5-9.3
4	Aspartic acid	6.0-15.2
5	Cystine	0.6-2.2
6	Glutamic acid	8.2-21.8
7	Glycine	3.2-4.0
8	Histidine	0.9-1.6
9	Isoleucine	3.7-4.5
10	Leucine	5.6-7.7
11	Lysine	3.0-4.5
12	Methionine	1.6-2.2
13	Phenylalanine	2.8-4.0
14	Proline	2.7-3.2
15	Serine	3.2-4.3
16	Threonine	3.2-4.5
17	Tryptophan	0.8-1.2
18	Tyrosine	3.9
19	Valine	4.2-6.0
20	Carbohydrates (g/100g)	13-16
21	Minerals (g/100g)	4.0-9.0
22	Lipids (g/100g)	4.0-7.0
Fatty acids (mg/100g)		
23	Palmitic acid	244
24	Gamma linolenic acid	135
25	Linolenic acid	97
26	Palmitoleic acid	33
27	Oleic acid	12
28	Stearic acid	8
29	Heptadecanoic acid	2
Vitamins (mg/100g)		
30	Thiamine	5.5
31	Riboflavin	4.4
32	Pyridoxine	0.3
33	Nicotinic acid	11.8
34	Pantothenic acid	1.1
35	Folic acid	0.05
36	Biotin	0.04
37	Cyanocobalamine	0.02
38	β -carotene	0.17
39	γ -tocopherol	19.0

Table 2: Net protein utilization of major food stuff¹.

Food stuff	Net protein utilization (NPU)%
Spirulina	62
Egg	94
Milk	70-82
Fish	80
Meat	67

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News**Plants Do Sums To Get Through The Night**

New research shows that to prevent starvation at night, plants perform accurate arithmetic division. The calculation allows them to use up their starch reserves at a constant rate so that they run out almost precisely at dawn.

Plants feed themselves during the day by using energy from the sun to convert carbon dioxide into sugars and starch. Once the sun has set, they must depend on a store of starch to prevent starvation.

Scientists at the John Innes Centre have shown that plants make precise adjustment to their rate of starch consumption. These adjustments ensure that the starch lasts until dawn even if the night comes unexpectedly early or the size of the starch store varies. And to adjust their starch consumption so precisely they must be performing arithmetic division.

During the night, mechanisms inside the leaf measure the size of the starch store and estimate the length of time until dawn. Information about time comes from an internal clock, similar to our body clock. The size of the starch store is then divided by the length of time until dawn to set the correct rate of starch consumption, so that, by dawn, around 95% of starch is used up. If the starch store is used too fast, plants will starve and stop growing during the night. If the store is used too slowly, some of it will be wasted.

(Source: www.sciencedaily.com)