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# Spirulina Farming: A Superfood

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## Introduction:

Spirulina is the dried biomass of multicellular filamentous cyanobacteria occurring as blue-green microalgae, which grows in warm alkaline conditions at temperatures of 22- 38℃ and pH of 8 to 11. Spirulina has an exceptionally high protein content around 60 to 70% on dry weight basis. It has long been regarded as a "superfood" due to its high concentrations of vitamins, minerals, proteins and antioxidants and the multiple health benefits it offers. Spirulina is cultivated worldwide as a food supplement and has possible applications in space foods, and addressing the issues of malnutrition and food security. The global spirulina market is estimated to reach a whopping $897.61 million by 2027, with an expected CAGR growth of 10.5% from 2020 to 2027. This article aims to shed light on the farming practices pertaining to the production of spirulina and highlight its potential as a superfood.

*Source: Algae-Lab*

## Health benefits:

- Spirulina is regarded as a superfood due to impressive composition comprising of more than 47% protein by dry weight, containing all essential amino acids. However, it has

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lower amounts of cysteine, methionine and lysine. The protein efficiency ratio (PER) of spirulina is 1.8-2.6, which is comparable to that of casein showing 2.5.

- Carbohydrates are approximately 15-25% comprising of glucose, fructose, sucrose, sorbitol, mannitol. It also contains mesoinositol phosphate which is source for phosphorus and inositol. Polysaccharides in spirulina are said to have a stimulating effect on DNA repair mechanism.
- It has lipid content of about 5.6-7%, and the rarely found gamma linolenic acid which has high nutrient value along with linoleic acid(omega6) and palmitic acid. These act as mediators of inflammatory and immune reactions.
- The vitamin and mineral content of spirulina warrants for it to be considered as a superfood.

| Vitamins | Composition per 100g | Minerals | Composition per 100g |
|---|---|---|---|
| Vitamin A | 352 IU | Calcium | 468mg |
| Vitamin K | 1090µg | Iron | 87.4mg |
| Vitamin B1 | 0.5mg | Phosphorous | 961mg |
| Vitamin B2 | 4.53mg | Potassium | 1660mg |

Fig: Vitamin and mineral content in spirulina per 100g.

(Source: Salmeán et al., 2015)

- Spirulina shows antioxidant properties due to its composition and is said to prevent NADPH oxidase overactivity disorders and has therapeutic potential with regards to vascular diseases, diabetes, cancer and inflammatory disorders. Spirulina also contains various antiviral biochemicals which scavenge free radicals and compounds.

Thus, Spirulina aids in the prevention of nutritional deficits, cancer, cellular ageing, infectious disorders and decreased immune system efficiency, as well as acting as an antioxidant. It is listed as a Generally Recognized as Safe (GRAS) substance by the US Food and Drug Administration (FDA).

**Spirulina Farming:**

The cultivation of Spirulina is a fairly simple procedure. It begins with carefully selecting the species to be used. *Spirulina maxima* and *Spirulina platensis* are two species most commonly utilized. The mother culture is then cultivated in open raceway ponds under optimal growth

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conditions in Zarrouks media. It is an alkaline growth media typically used for Spirulina. Temperatures between 29C-35C, a pH above 9, ample sunlight, and proper mixing and aeration in the ponds are essential for the growth of high protein content Spirulina. It can typically be harvested five days post the seeding process and the most suitable time for harvesting is early morning. Harvesting can be done either by centrifugation or filtration. Although highly digestible when consumed fresh, spirulina is usually dried to extend its shelf life to about a year or more. This dried mass is then ground into powders that can be further pressed into pellets. Spirulina is commercially available in the powder and tablet forms and can also be added to protein and energy boosting powder mixes, used as feed for aquaculture and as food colour extract.

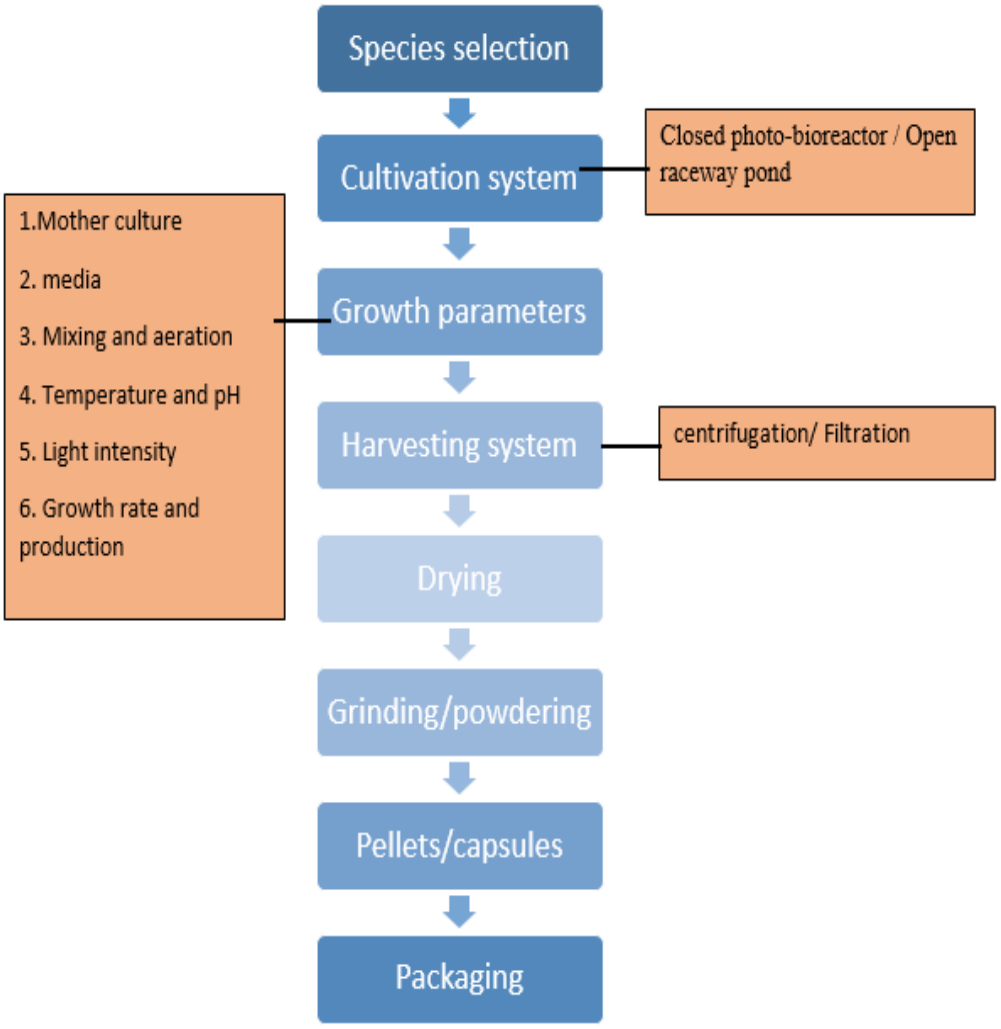


Fig: Steps in spirulina farming

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*Source : Hawaiian spirulina worlds healthiest food*

*Source: Kim et al. 2018*

**Indian Scenario:**

India is a developing nation and chronic malnutrition among children and women has been a longstanding challenge for the country. India's child malnutrition rates are one of the most alarming in the world. Supplementing spirulina products in the diet could help combat this social issue. The Commercialisation of spirulina can also provide as a productive source of income and employment. The Agri-Clinics and Agri-Business Centre (ACABC) Scheme 2002, is a central sector scheme set up by the Government of India to encourage entrepreneurial ventures in the agriculture sector and provide extension services to farmers. Spirulina farming requires much less land and water to produce protein and energy as compared to livestock. The spirulina market in India is expected to witness rapid growth in the coming years, driven by domestic players like Algene Biotech., favourable climatic conditions, low production cost, and increasing demand for dietary supplements.

**Conclusion**:

With an increased exposure to the benefits of 'superfood' i.e. spirulina it is only a matter of time that the world recognises the gains in commercialising its production. Today, over 22 countries cultivate spirulina on a commercial scale. Spirulina significantly adds to the nutrient value of a regular diet. It can act as a crucial tool in tackling problems of global malnutrition and food insecurity. Its high production rate and minimal capital requirement has made spirulina an attractive commodity in the food market.

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Spirulina Market by Distribution Channel (Consumer Channel, Business Channel), Product Type (Powder, Tablets, Capsules, Flakes, Phycocyanin Extract), Application (Nutraceuticals, Food and Beverages, Agriculture, Animal Feed) - Global Forecast to 2028- meticulousresearch

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