

Arthrospira platensis and its derived products

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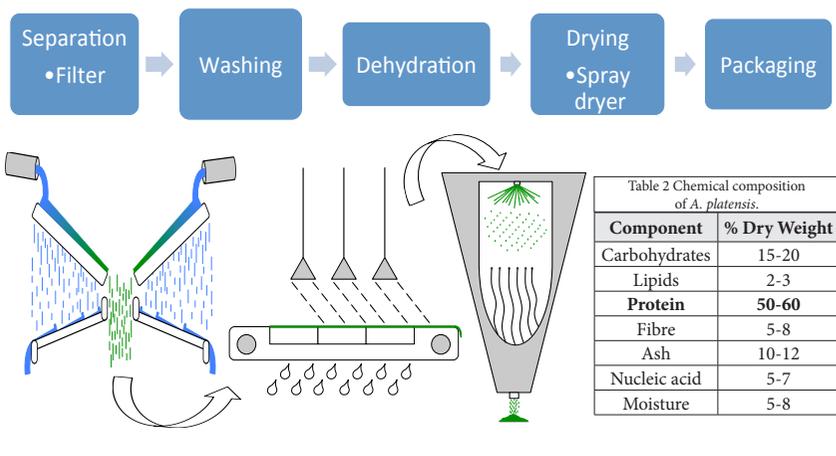
Motivation

Arthrospira platensis was the first cyanobacterium to be commercially cultivated using modern biotechnology. Its use has expanded from the original application to the production of fine chemicals for clinical diagnosis and cosmetic applications. Recent studies of the therapeutic and health effects are expected to promote the application of this organism in pharmaceutical and nutraceutical industries.

What is a Cyanobacteria?

- Obligate photoautotrophs phylum and synthesize chlorophyll a.
- Multicellular left-handed helical trichomes and motility by rotation along its axis.
- Reproduction based on fragmentation of the mature trichome into a number of shorter segments.
- Cell wall composed of four layers, with a structural layer of peptidoglycan.

1. Dietary supplement



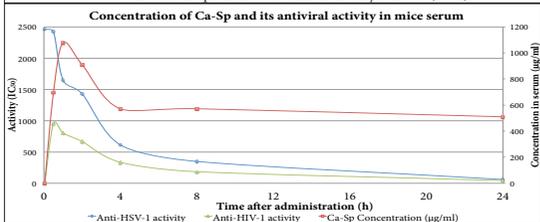
3. Calcium-Spirulan Exopolymer

- **Anticoagulant activity:** thrombin inhibition through interacting with heparin cofactor II (a physiological inhibitor of this serine-protease).

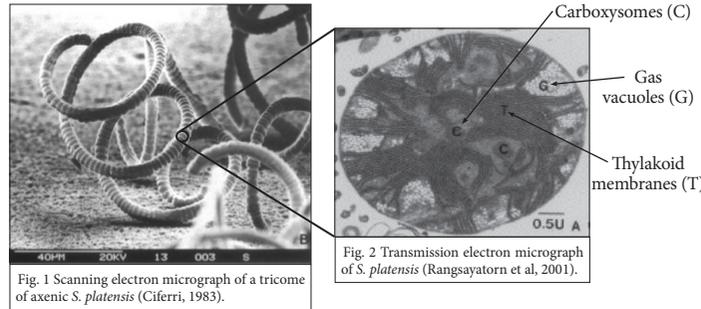
Table 3 IC₅₀ of sulfated polysaccharides for thrombin inhibition in the presence of heparin cofactor II. Data taken from Majidoup et al (2009).

Sources	Polysaccharides	IC ₅₀ (µg/mL)
Blue-green algae	Ca-Sp from <i>A. platensis</i>	1.7
Sea urchins	Sulfated α-galactan	6
Red algae	Sulfated D-galactan	0.23

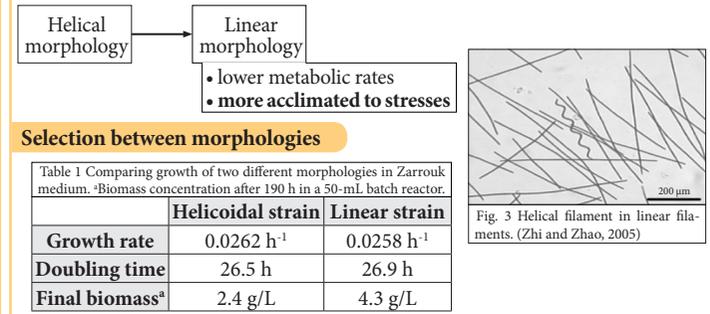
Fig. 6 Concentration of drug and antiviral activity in sera obtained from mice intravenously treated with calcium spirulan. Data taken from Hayashi et al (1996).



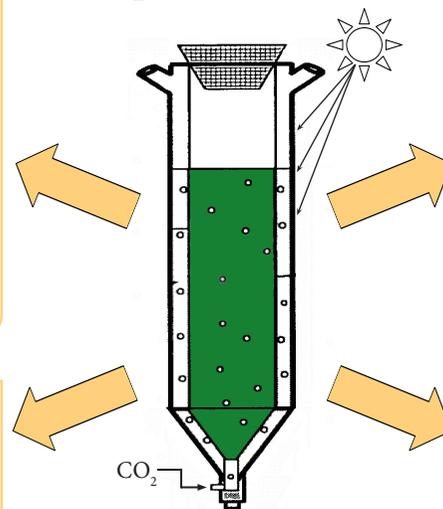
- **Anti-Herpes Simplex Virus and Anti-Human Immunodeficiency:** inhibition of virus binding to host cells and the subsequent virus-cell fusion.



Linear and helical morphologies



Arthrospira platensis production in photobioreactor



- Closed culture environment
- Controlled conditions
- Design criteria: surface-to-volume ratio

Conclusions

Arthrospira platensis is highly nutritious and shows higher concentrations of nutrients compared to other food sources. According to all therapeutic benefits, it is not so far to become the food of the future.

2. Phycocyanin

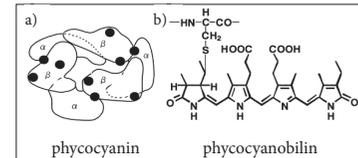
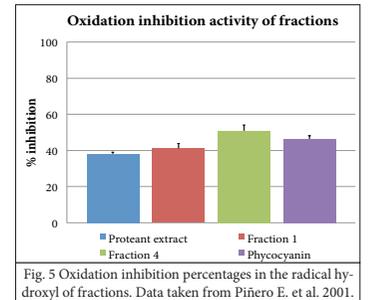


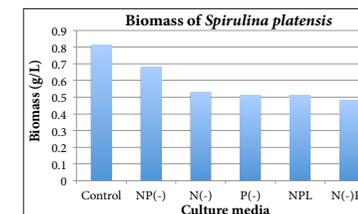
Fig. 4 (a) The structures of phycocyanin (two kinds of protein to form αββ3); and (b) phycocyanobilin, one on α-chain and two on β-chain.

- **Antioxidant activity:** phycocyanin is mainly the component responsible for the antioxidant activity of the protean extract of *A. platensis*.
- After purification, antioxidant activity is measured by Scavenging activity of hydroxyl radical.

- Colourant in food and cosmetic.
- Immunomodulating and anti cancer activities.
- Phycocyanin probes for immunodiagnostics.

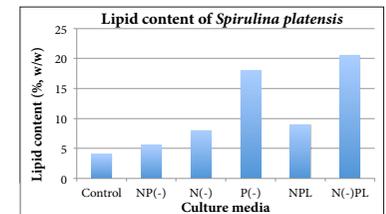


4. Oil for biofuel



- Nitrogen limitation improves lipid production.
- Phosphorous is the critical element to control to maximise the lipid content.
- Most common fatty acids: c-linolenic, linoleic, palmitic acids and oleic acid.

- Low fatty acid content compared to other algae.
- Highly production of biomass generation.



References

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