THE SILVER LINING OF CYANOBACTERIA – the case of phycocyanin

Objectives

In the environment cyanobacteria can form blooms that can be responsible for many problems. However, cyanobacteria can be used to extract high-value products, and can be applied in several fields (e.g. nutraceuticals, aquaculture, bioenergy). Among these products is phycocyanin (PC), a blue pigment mainly found in cyanobacteria, with high market value and many applications.

1- CYANOBACTERIA PRODUCTION

• Cyanobacteria Spirulina platensis, Anabaena cylindrica, and Nostoc sp., were cultured under controlled conditions.
  - 26 ± 2 °C; photoperiod: 16h-L/8h-D; 2000 lux

2- PC EXTRACTION

• PC was recovered using 150 mM sodium phosphate buffer pH 7 in a solid-liquid extraction

After precipitation with ammonium sulfate and ultrafiltration

3- BIOLOGICAL ACTIVITY OF PC EXTRACTS

• Antioxidant activity was assayed by the ABTS method, using ascorbic acid (AC) as a positive control.

ABTS

• Antimicrobial activity was assayed by the Kirby-Bauer Disk Diffusion test.

Gram-negative
  - Escherichia coli
  - Pseudomonas aeruginosa

Gram-positive
  - Staphylococcus aureus
  - Bacillus cereus

HaCaT 72h

• Biocompatibility was assayed in human keratinocytes (HaCat), through the cell viability assay (MTT).

Conclusions

- Under the tested conditions, Nostoc sp. was the best PC producer.
- None of the tested extracts showed antimicrobial activity.
- Raw extracts presented better results than purer ones. These extracts showed high antioxidant activity, higher than the positive control, ascorbic acid, as well as a good biocompatibility in skin cells.

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References