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ABSTRACT
BOOK

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ID679 | Where photosynthetic aquatic microorganisms meet thought: Pavlova gyrans RCC1553 and Synechocystis sp. LEGE07211 in neuroprotection

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Background: Neurodegenerative diseases (NDs), such as Alzheimer, Parkinson, and Huntington, are severe disabling conditions defined by the progressive loss of nerve cells. Current treatments are often associated with uncomfortable side effects, limited long-term efficacy, and the absence of true disease-modifying agents that can halt or reverse progression. Microalgae and cyanobacteria comprise new sources of discovery of potential new treatments.

Methods: Pavlova gyrans RCC 1553 and Synechocystis sp. LEGE 07211 extracts were screened to assess neuroprotective activity. Organic (acetone, ethanol, methanol) and aqueous extracts were tested across cell lines (3T3-L1, Raw 264.7, SH-SY5Y, and hCMEC/D3) for cytotoxicity (MTT assay), antioxidant activity (DPPH assay), anti-inflammatory activity (Griess assay in LPS-induced macrophages), and acetylcholinesterase (AChE) and n-secretase inhibition. Untargeted metabolomics (LC-HR-MS/MS) was employed for metabolite annotation using GNPS, SIRIUS and MetaboAnalyst.

Results: All the extracts were non-cytotoxic across the panel of cells. The highest antioxidant activity was found in the aqueous extract of Synechocystis sp. ($82,61 \pm 4,10$ %), followed by its methanolic extract, ($63,97 \pm 2,63$ % scavenging activity, both at 0,56 mg/mL. The methanolic extract of P. gyrans exhibited a ($48,72 \pm 0,95$ % scavenging activity. Organic extracts showed anti-inflammatory activity by restoring nitric oxide levels to the baseline. The strongest AChE inhibition was observed in acetone extracts at 6,25 µg/mL, with Synechocystis sp. showing ($70,68 \pm 2,15$ % inhibition and P. gyrans ($64,60 \pm 1,47$ %). The metabolomics analysis revealed fatty acids as the predominant metabolite class in active extracts (46,67%), followed by amino acids/peptides and terpenoids (20 % each).

Conclusions: Extracts from P. gyrans RCC 1553 and Synechocystis sp. LEGE 07211 exhibited antioxidant, anti-inflammatory, and AChE inhibitory activities without cytotoxic effects. Untargeted metabolomics analysis mainly identified fatty acids, as possible bioactive metabolites. These findings demonstrate the neuroprotective potential of aquatic photosynthetic microorganisms against NDs.

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