Exploring biodiversity in Salt Ponds of Trapani: Harnessing Halophilic microorganisms for Biotech Applications.

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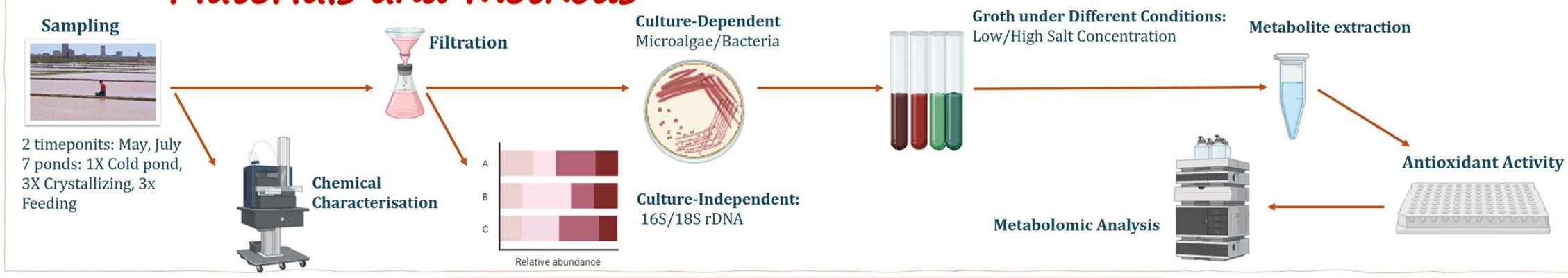
BACKGROUND

Saltern ponds of Trapani are a valuable model for isolating halophilic microorganisms with potential industrial applications. They are unique due to their varying salt and organic carbon concentrations, creating a diverse microorganism-rich environment. Under challenging conditions, selected halophilic microorganisms can produce protective **biomolecules** against oxidative damage. **This project aims** to comprehensively characterize the microbiota and chemical components in different ponds and seasons (**1**) of Trapani's saltern ponds and to exploit their ability as cell factories to synthesize bioactive metabolites under various growth conditions (**2**). Promising candidates underwent assessment for antitumoral and antioxidant activities on human cell lines.

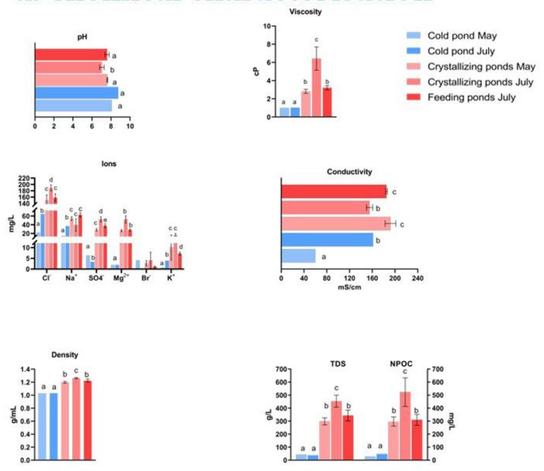
Materials and methods



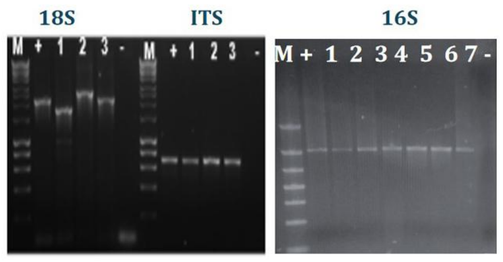
RESULTS

1. Chemical and Biological Characterisation

a. Chemical characterisation



b. Colony PCR



c. Metabarcoding 16S/18S rDNA

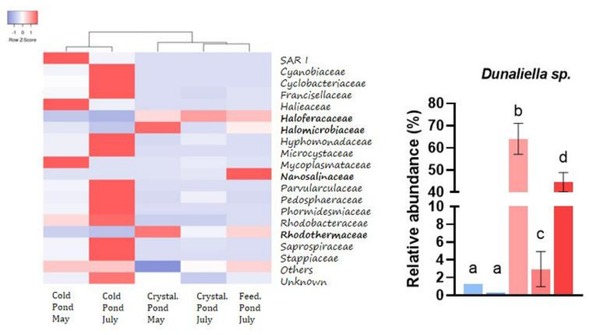
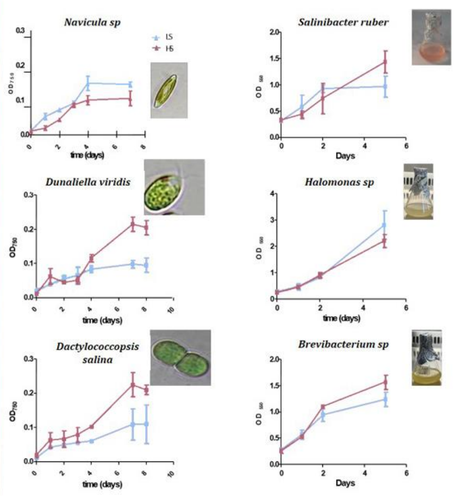


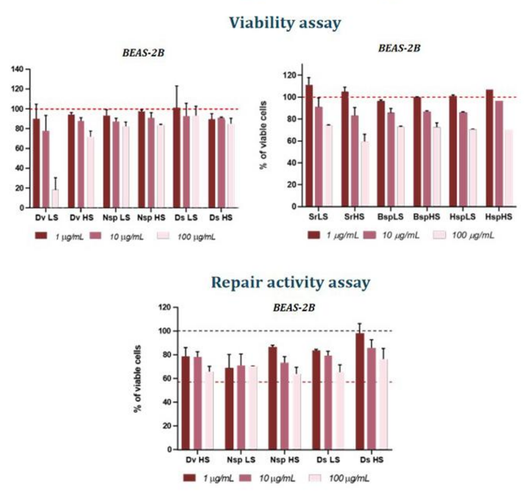
Fig. 1. (a) Chemical characterisation of different saltern ponds. **(b) Electrophoresis analysis** of Colony PCR's products. **18S rDNA** and **ITS** were used as molecular markers for species identification of microalgae and **16S rDNA** for bacteria. **M**, molecular weight marker; **+**, 1 ng of bacterial or microalgal DNA (positive control); **–**, no template (negative control). **1-7**= single colonies. (**c**) Microbiota analysis at family level in cold crystallizing, feeding, and cold pond.

2. Industrial application of new isolates

a. Growth curves



b. Biological assays



c. Biomass analysis

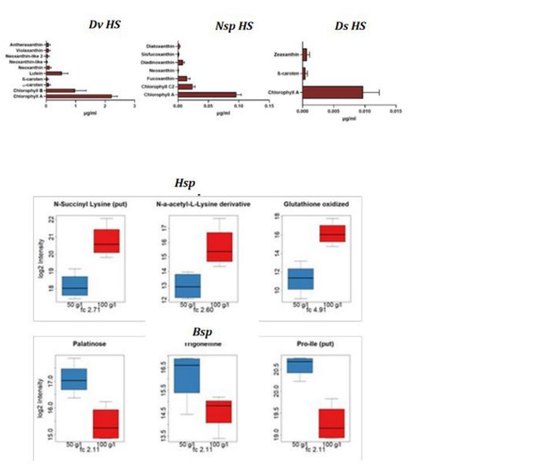


Fig. 2 (**a**) **Growth curve** of selected strains: *Navicula sp* (Nsp), *Dunalliella viridis* (Dv) and *Dactylococcopsis salina* (Ds), *Salinibacter ruber* (Sr), *Halomonas sp* (Hsp), and *Brevibacterium sp* (Bsp) under high (HS) and low salinity (LS). (**b**) Upper bar graphs show the **viability assay** of Bronchial epithelial (BEAS-2B) cell lines treated with different concentrations of algal extracts (1, 10, and 100 µg/ml). Red dotted bar represents the viability of untreated cells. Lower bar graph shows the **repair activity assay** of BEAS-2B pre-injured with 10 mM of H_2O_2 for 1 hour and treated with 100, 10, and 1 µg/ml of algal extracts as recovery treatment. Red bar represents cell viability of untreated control. Black bar represents cells treated with only medium after oxidative stress. (**c**) Upper bar graphs represent **pigment concentration** of photosynthetic microorganisms. Lower graphs represent different **metabolite concentration** in heterotrophic microorganisms.

CONCLUSIONS & PERSPECTIVES

- ✓ Novel strains of **halotolerant microorganisms,** including bacteria and microalgae, were isolated from salt ponds of Trapani.
- ✓ Some strains exhibited moderate **cell repair activity**, suggesting potential use in cosmetics.
- ✓ Further **isolation** and **cultivation** of microorganisms from these ponds are ongoing.
- ✓ Biological assays, including **antibacterial**, **antitumoral** and **plant growth-promoting** activities, will be conducted on the new isolates.
- ✓ Fractionation and metabolomics analysis of promising metabolite extracts will be performed to identify and characterize bioactive compounds.

Acknowledgements

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