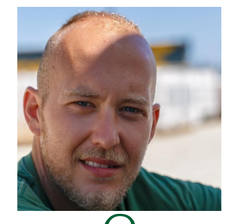
Drying microalgae using an industrial solar dryer: A biomass quality assessment



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AIMS

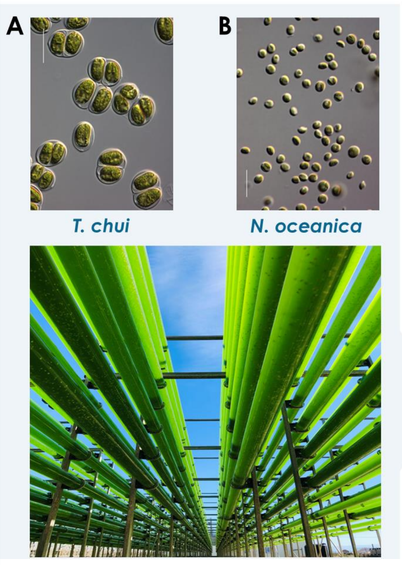
1. Evaluating an indirect and hybrid solar dryer as an alternative to conventional freeze drying of industrially produced *Tetraselmis chui* and *Nannochloropsis oceanica* wet paste
2. Assessing effects of the drying method on biomass quality parameters, including biochemical profiles, functional properties, and microbial safety

STUDY HIGHLIGHTS

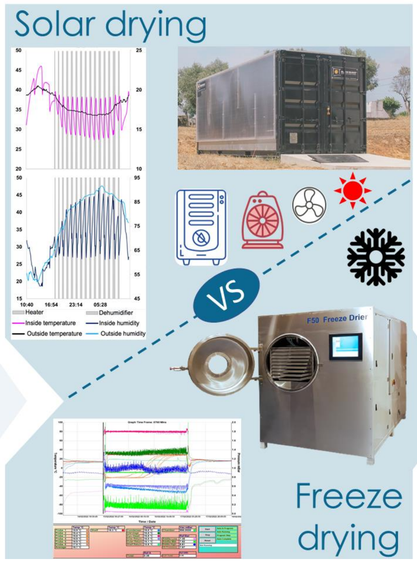
- **No significant differences were found** between the applied drying technologies **for proteins, carbohydrates, lipids, and fatty acid profiles**
- **Some pigments** showed **higher contents in freeze-dried samples**
- **Minor differences** were registered in the **mineral profiles (< 10%)**
- **Analyses of microbial safety and functional properties** of the solar-dried biomass appear **adequate for food and feed products**

MATERIALS & METHODS

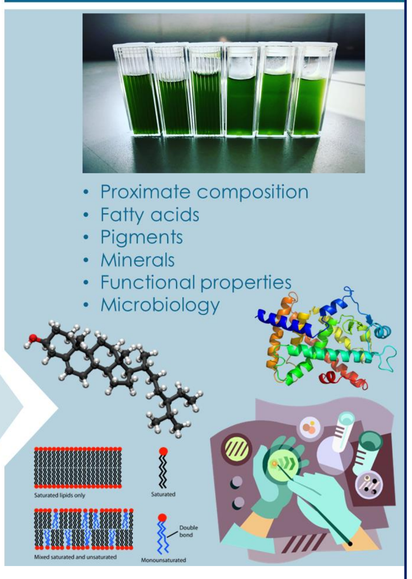
Biomass production



Drying process



Biochemical analyses



HYBRID AND **INDIRECT**
SOLAR DRYING SYSTEM

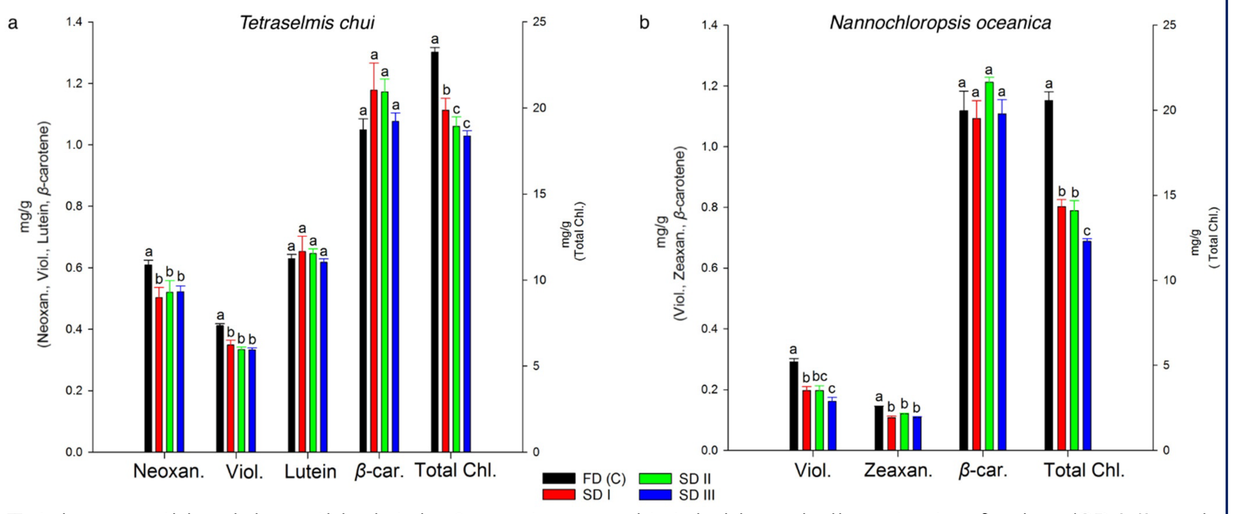
- **SOLAR HEATED AIR**
- **HEATER + DEHUMIDIFIER**

AIR INTAKE SOLAR COLLECTORS

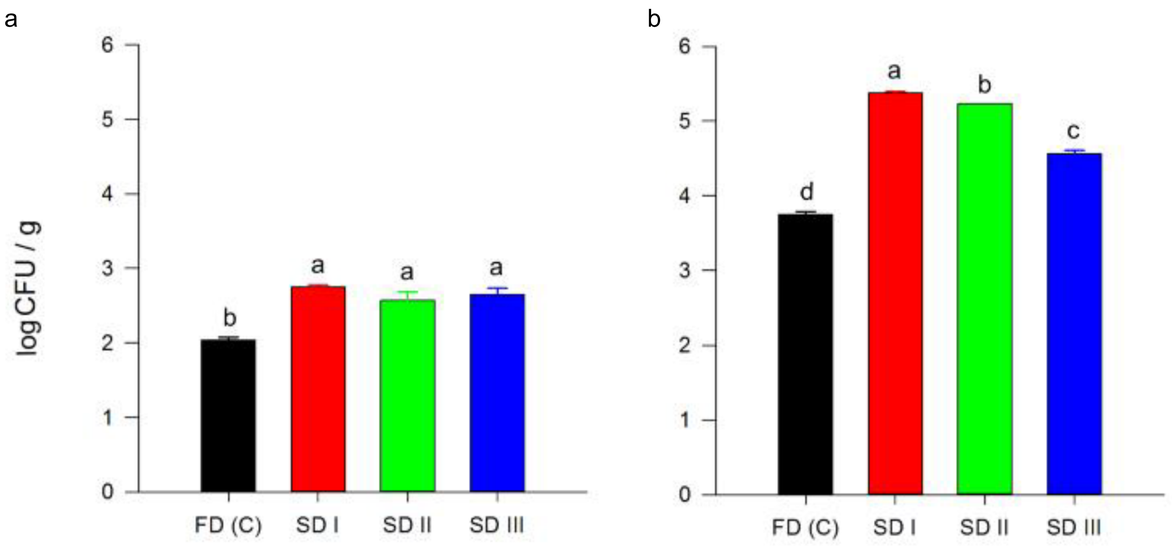
NO DIRECT SUNLIGHT

BBLOX® ALGORITHM DESIGNED TO MAINTAIN
MAXIMUM POSSIBLE TEMPERATURE +
MINIMUM POSSIBLE HUMIDITY

RESULTS



Total neoxanthin, violaxanthin, lutein, β-carotene, and total chlorophyll contents of solar- (SD I, II, and III) and freeze-dried (FDc) *Tetraselmis chui* (a). Total violaxanthin, zeaxanthin, β-carotene, and total chlorophyll contents of solar- (SD I, II, and III) and freeze-dried (FDc) *Nannochloropsis oceanica* (b). Different letters represent significant differences detected by Tukey's post hoc range test (HSD, ANOVA). Data points are shown as mean ± Std Dev (n = 3). Error bars represent standard deviations.



Total counts (PCA), of solar- (SD I, II, and III) and freeze-dried (FDc) *Tetraselmis chui* (a) and *Nannochloropsis oceanica* (b) biomass. Different letters represent significant differences detected by Tukey's post hoc range test (HSD, ANOVA). Error bars represent standard deviation (Std Dev). Data points for solar- and freeze-dried samples are shown as mean ± Std Dev (n = 3).

Additional results:

- **No significant differences:** proteins, lipids, carbohydrates and fatty acids
- Statistical differences **< 10 %** for **minerals**
- **Solar-dried** microalgal biomass can be considered **food safe** and meet **regulatory target guidelines**

CONCLUSIONS

- This study demonstrates that **indirect hybrid solar drying** holds a **high potential** to be a **viable alternative to conventional drying technologies**
- **Solar drying** appears promising to **preserve high-quality microalgal biomass** at expected **lower costs**

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