Nutritional Profiling and Stability Analysis of Selected Microalgae

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Microalgae are emerging as a valuable source of nutrients and bioactive compounds[1], offering substantial potential for applications in food[2]. This study provides a comprehensive biochemical characterisation of several microalgae species, including *Chaetoceros calcitrans*, *Cylindrotheca fusiformis*, and *Nannofrustulum shiloi*, focusing on protein content, mineral composition, amino acid profile, and shelf-life stability.

In terms of protein content, *Chaetoceros calcitrans* exhibited the highest concentration at approximately 42% (w/w), followed by *Cylindrotheca fusiformis* and *Nannofrustulum shiloi*, which had protein contents of around 31% (w/w) and 27% (w/w), respectively. These findings highlight relevant protein levels and significant variations among different microalgae species, necessitating future studies on their quality and bioavailability.

Mineral analysis revealed that *Nannofrustulum shiloi* contains about 70% calcium. Additionally, this microalgae is rich in sodium (Na), potassium (K), magnesium (Mg), and iron (Fe). Importantly, no heavy metals were detected in any of the analysed species, confirming their safety for food applications.

Amino acid profiling of lyophilised biomass from *Chaetoceros calcitrans* and *Cylindrotheca fusiformis* showed high concentrations of essential amino acids, including leucine, isoleucine, methionine, phenylalanine, and threonine (ranging from 1.10 to 8.42 g/100 g_{DW}).

Shelf-life assessments revealed that *Nannofrustulum shiloi* maintained a stable amino acid composition over time, with only minor variations between the initial (T0) and subsequent (T2) storage periods (October 2023 and April 2024, respectively), suggesting that the dried biomass of this species retains its nutritional properties during extended storage. Conversely, *Cylindrotheca fusiformis* displayed notable changes in amino acid levels after storage, indicating that storage conditions can significantly affect its protein composition.

These results underscore the nutritional potential and stability of certain microalgae species, particularly *Nannofrustulum shiloi*, for food applications. The observed variations in protein and amino acid profiles across species provide valuable insights for the development of functional food ingredients derived from microalgae.

Acknowledgements: The authors would like to thank "Pacto da Bioeconomia Azul" – Project No. C644915664-00000026. We would also like to thank the scientific collaboration under the FCT project UIDB/50016/2020.

Funding: This work was financially supported by "Pacto da Bioeconomia azul" (Project No. C644915664-00000026) within the WP5 Algae Vertical, funded by Next Generation EU European Fund and the Portuguese Recovery and Resilience Plan (PRR), under the scope of the incentive line "Agendas for Business Innovation" through the funding scheme C5 - Capitalization and Business Innovation.

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