



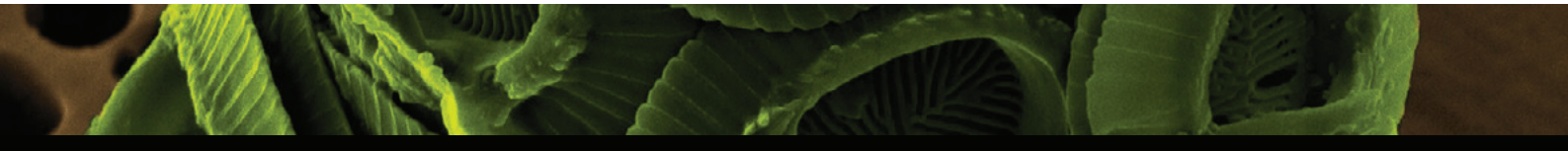
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LOW-ENERGY HARVESTING AND DRYING METHODS FOR *Spirulina maxima*: EFFECT ON PHYCOCYANIN CONTENT.

Batista, Ana Paula^{1,2}, Monteiro, Ana Carina^{1,2}, Loureiro, David², Gouveia, Luísa², Sousa, Isabel¹, ¹LEAF - Linking Environment, Agriculture and Food, Instituto Superior de Agronomia, Universidade de Lisboa, Portugal. ²Unidade de Bioenergia LNEG - Laboratório Nacional de Energia e Geologia, Portugal. (Sponsored by Ana Paula Batista Acknowledges Fundação Para A Ciência E A Tecnologia (FCT) For Post-Doc Grant SFRH/BPD/84812/2012)

Microalgae downstream processing can have a significant impact on the quality of target biomolecules. Moreover, harvesting and drying represent around one third of the total energy for microalgae production. *Spirulina* is a good protein source, with balanced aminoacid profile, as well as of highly valuable phycobilliprotein pigments (phycocyanin). In the present work, *Spirulina* cultures were submitted to alternative low-energy harvesting and drying methods, and the resulting impact on phycocyanin content was assessed. Electrocoagulation is a promising harvesting method requiring low energy input and no direct addition of chemicals. In this technique, an electrical current is applied to the culture, resulting in the formation of flocks which are subsequently removed after sedimentation and/or flotation. Different electrocoagulation conditions were tested, namely electrode area (32-64cm²), current density (3-30mA/cm²), treatment time (5-10min), sedimentation time (15-60min) and pH (4.5-6.5). Best results were attained through pH manipulation, with removal efficiency (RE) above 90% for pH<6, although phycocyanin yield (PY) decreased for lower pH values (for pH 6: RE=88%, PY=96%). When compared to traditional harvesting methods, electrocoagulation has resulted in a significantly lower energy consumption: 0.1Wh/L rather than 107Wh/L for centrifugation (10000rpm/20min/4°C, RE<70%) and 50Wh/L for filtration (1-3mm/85cmØ/2bar). Biomass was dried for 4h indirect ventilated solar dryer, in a clear autumn day with T_{amb}=19-24°C (T_{interior}=33-47°C), average solar radiation of 317W/m², yielding 97.4% water removal (WR) and 76%PY. Drying in an electrical oven at 60°C/4h (99.6%WR) has led to significant phycocyanin degradation with only 53%PY. Freeze-drying (-50°C/vacuum) was the mildest method with 95%PY, although a much longer time was needed (8h, 99.5%WR) and is associated to a higher investment and energy cost. Therefore, solar drying can be regarded as a middle-ground alternative method involving low phycocyanin degradation and reduced energy consumption: 0.08kWh vs. 0.44kWh and 2.94kWh for oven and freeze-dryer, respectively.