ARTHOASPIRA PLATENSIS CULTIVATION USING GEOThERMAl CO₂ AND HEAT

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Company info:
Fotosintetica & Microbiologica S.r.l. (F&M) is a spin-off company of the University of Florence founded in 2004 to exploit the know-how on microalgae physiology and mass cultivation developed by the university team. F&M offers consultancy on microalgal cultivation for several applications, among which CO₂ sequestration and wastewaters treatment, feed, food supplements, nutraceutical and bioactives. F&M offers consultancy and training on all stages leading from strain isolation to biomass production and valorization. F&M commercializes several cultivation systems: glass bubble columns for inoculum production, annular columns, the Green Wall Panel (GWP®) series and raceway ponds for pilot and large-scale cultivation. F&M knowledge, along with proprietary photobioreactor technologies and a collection of over 1200 microalgal strains, makes the company the ideal partner for starting applied research and commercial activity on microalgae.

Abstract:
Tuscany (Italy) is the most important area for geothermal electrical energy production in continental Europe, with 34 geothermal plants for a total installed power of about 930 MW. In Tuscany about 32% of the electrical energy requirement is provided by geothermal sources. CO₂ enriched gas and heat
represent the two main outputs of the geothermal derived electrical energy. Large-scale algae facilities require huge amounts of CO₂ for algal growth and heat for culture thermoregulation and biomass drying. Thanks to Enel Green Power S.p.A. (EGP) financial contribution, a 120 m² pilot algae facility was built by F&M close to one EGP power plant at Chiusdino (Siena, Italy) to evaluate the use of geothermal streams (CO₂, condensed steam (40-45°C) and cold water (25°-28°C) from cooling tower), in the cultivation of microalgae. The pilot plant has been operated since June 2017 with A. platensis F&M-C256 grown outdoors in raceway ponds and Green-Wall Panel (GWP*) reactors to compare performances. The use of geothermal CO₂ did not reduce biomass productivity in both pond and GWP* when compared with food grade CO₂. Heavy metal content in the biomass confirmed the possibility to use geothermal CO₂ as source of carbon. Condensed steam and cold water were used for culture temperature control. Warmed cultures, regardless of the culture system used, attained higher (+ 43%) productivity. Mass and energy balances extrapolated to 1 ha size showed that the availability of geothermal heat and CO₂ reduces biomass production cost of more than 50%.

**Keywords:**
Geothermal energy, *Arthrospira platensis*, GWP* photobioreactor,
ABSTRACT BOOK

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