USE OF CO_2 FROM ACCELERATED COMPOSTING PILES AS A CARBON SOURCE FOR CULTURE OF MICROALGAE TO PRODUCE TRIGLYCERIDES

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Introduction. Carbon dioxide (CO_2) is a main greenhouse gas. Reducing the build-up of atmospheric CO_2 can be accomplished by utilizing microalgae, which have the ability to use CO_2 for the synthesis of fatty acids. These can be extracted and converted into biodiesel, an environmentally friendly fuel (1). The aim of this study was to evaluate the effect of CO_2 from accelerated composting piles as a carbon source for the culture of microalgae to produce triglycerides (molecules that contain fatty acids).

Methods. Degradation of organic solid wastes (OSW) was evaluated at laboratory and semipilot plant scale in columns and helical ribbons rotating reactor, respectively. The composting mixtures contained (dry weight): OSW (85%), paper (3%), mature compost (3%), bovine manure (2%) and bagasse and stubble (7%). Aeration rate of 1 VKgM (defined as 1 liter of air per kilogram of moist medium per minute) was used. The CO_2 production rate was evaluated by respirometry (2). A flat laboratory scale photobioreactor was used for the microalgae (*Nannochloropsis sp*) culture.

Results. In composting process at laboratory and semipilot plant scale 73 % of degradable organic fraction of solid wastes was degraded in 120 h. The degradation rate constant was 0.27 ± 0.05 d^{-1}, corresponding to a total dry matter loss of 280 g/(kg of initial dry weight (idwt)) (3). The amount of CO_2 obtained was ~230 g/(kg idwt), (Figure 1).

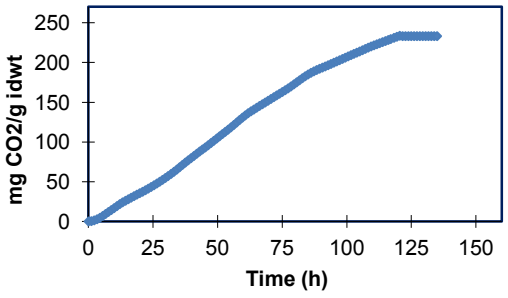

Fig.1. Total CO_2 produced in an accelerated composting process at laboratory scale.

On the culture of *Nannochloropsis sp* in a photobioreactor with an illumination of 15000 lux, biomass reached a maximum of 1.4 g/L (Figure 2). The fraction of carbon in the microalgal biomass was ~0.5 (4). Consequently, the CO_2 production (230 g/kg idwt) in accelerated composting process would allow to produce 460 g of biomass (31 – 68 % dwt of fatty acids).

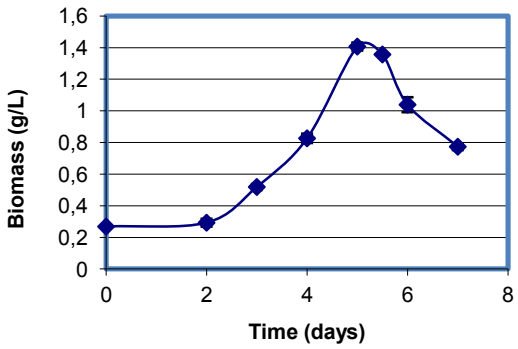

Fig 2. Growth curve of *Nannochloropsis sp.*

Conclusions. The proposed process represents a promising alternative to obtain triglycerides from microalgae. An amount between143 g and 313 g of fatty acids per kg of dry weight of composting mixture could be produced by this process.

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