Optimization of Microalgae Cultivation on OMW Phenols

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Phenols are chemical compounds, which can be found in different sources. Most of them are known to have beneficial properties for human nutrition due to antioxidant activity and other characteristics. However, their presence in wastewaters is worrying because they have antimicrobial and phytotoxic effects leading to serious issues in classic biological wastewater treatments and for their use as soil fertilizer. The ability of microalgae to degrade different kinds of phenols has been investigated and described in several works. Microalgae can degrade different phenols like phenols, chlorophenol, cathecol and tyrosol, and can grow on wastewaters, like for example olive mill wastewater (OMW), containing a large amount of phenols in a complex mixture. In particular wastewater utilization for microalgae production has received an increasing interest in the latest years. Microalgae are promising sources for biofuel production in the future. However, they currently have some limits, which are represented by economic and environmental low sustainability of the processes for these productions. Wastewater utilization potentially can help to overcome these limits furnishing a cheaper source of nutrients. However, the presence of phenol compounds can reduce microalgae growth. In this work, an optimization of microalgae cultivation in presence of phenols is carried out. In order to isolate effect of phenols, they were separated and purified by OMW and then added to the culture media. This was done by using different technical, which were compared. Phenol separation was carried out by alkaline precipitation procedure, OMW drying and OMW treatment with the resin amberlite XAD16. By alkaline precipitation phenols were removed from OMW until 50 %. However, this method was not efficient for phenol reutilization, indicating degradation phenomena. On the contrary, with the same procedure 55% of phosphates could be precipitated and then recovered with 75 % of yield. By resin treatment, 60 % of the phenols were globally recovered from OMW, also in repeated cycles. For microalgae cultivation, a *Scenedesmus* sp. strain was tested, and the best results were obtained by using phenols from resin. Instead, direct utilization of OMW led to increase the contamination by other microorganisms, like fungi and bacteria, with reduced microalgal growth. Different physiological states of the inoculum were tested indicating that an inoculum in exponential state of growth is required for *Scenedesmus* sp. growth in presence of phenols to ensure a reduced contamination. In the tested conditions of cultivation phenol concentration were reduced during growth until to 60 %. Different initial phenols concentrations were also compared indicating 100 mg/L (tyrosol equivalents) as the optimal one.