INTRODUCTION

Nowadays modern world is currently facing a dangerous energy problem due to the increase of world consumption of energy (**Vasudevan and Briggs, 2008).** This generates a great dependence on the fossil fuels, like petroleum. This dependence produces two inconveniences: the limited origin of petroleum and the emission of pollutant gases. As a result new alternatives and sustainable energy sources are vital **(Bruce, 2008; Sims *et al*., 2010)**. Among the various forms of alternative energy currently under study, biodiesel exhibit particular promise **(Hill *et al*., 2006; Miao and Wu, 2006; Behzadi and Farid, 2007)**. Biodiesel is an alternative liquid fuel produced by chemical reaction between a plant oils or an animal fats in presence of a catalyst which is eco-friendly and renewable **(Meher *et al*., 2006; Marchetti *et al*., 2007)** but, the use of edible vegetable oils for fuel production will compete significantly with food uses, and this would result in undesirable increase in food and biodiesel costs (**Demirbas, 2008**).

Microalgae are sunlight-driven cell factories that convert carbon dioxide to potential biofuels **(Ghirardi *et al*., 2000; Akkerman *et al*., 2002; Melis, 2002; Metzger and Largeau, 2005; Singh *et al*., 2005; Spolaore *et al*., 2006).** Algal oils were found to be a good alternative for the production of biodiesel rather than vegetable oils (**Schenk *et al*., 2008)** so; a great attention was monitored to enhance the production of high lipid from algae. It was proved recently that algal oil considered as a good biodiesel producer. In this regard, microalgae have emerged as one of the most promising feed stocks owing to their wide spread availability and higher oil yields. Unlike traditional oil seed crops, microalgae can grow in places away from the farmlands and forests such as ponds, fermentation units and even wastewater (**De-Bashan *et al*., 2004**), thus minimizing the damages caused to the eco- and food-chain systems **(Sheehan *et al.*, 1998; Chisti, 2007). Illman *et al*. (2000)** had studied calorific values of *Chlorella* strains grown in low nitrogen medium including four fresh water strains (*C. protothecoides, C. vulgaris , C. emersonii and C. sorokiniana*) and one marine strain (*C. minutissima*). They suggested that *Chlorella* strains may be suitable for diesel replacements. Also, **Xu *et al*. (2006**) found that the microalgae *Chlorella protothecoides* produce high quality of biodiesel. The economic feasibility of algal mass culture for biodiesel production greatly depends on the high biomass productivity and appreciable lipid yields. Microalgae lipids to be cost competitive as a liquid fuel source should contain at least 50– 60% of their biomass lipids. Microalgae contain lipids and fatty acids as membrane components, storage products, metabolites and sources of energy. So the current intense global race towards viable and sustainable renewable energy considered the algal biomass to be the best target for this purpose.