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EFFECT OF TEMPERATURE VARIATION ON THE EFFICACY OF *CHLORELLA VULGARIS* IN DECOLORIZATION OF CONGO RED FROM AQUEOUS SOLUTIONS

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ABSTRACT : The current study deal with the effect of temperature variation on the efficacy of greenalgae *Chlorella vulgaris* on the removal of the cancerous synthetic dyes of Congo red from their aqueous solutions. An algae isolated from local Iraqi aquatic environments and cultured under controlled laboratory conditions using different concentration (50, 150 and 250 ppm) and different temperatures (15, 25 and 35ºC) in different period times (3, 7, 9, 11 and 13 days). The results showed that the best temperature for decolorization by *Chlorella vulgaris* was (35ºC) for an period of (9 days) and concentration (50) ppm with the complete removal (100%), the efficiency of the *Chlorella vulgaris* in the removal of pollutants fall under the influence of many different environmental factors including temperature. The capacity of *Chlorella vulgaris* to survive and grow in the presence of high concentrations of the congo red dye, show that this strain may possess potential to be used in bioremediation of dyes contaminated environments.

Key words : Temperature, congo red, *Chlorella vulgaris*, water pollution, biotreatment.

INTRODUCTION

Biotreatment involved the use of biological systems for the removal or reduction of pollutant from different environmental media (Luka *et al*, 2018). It has confirmed to be a safe, effective, low-cost and environmentaly friendly alternative for sustainable treatment environmental pollution by hazardous and recalcitrant pollutants (Singh, 2006; Shukla *et al*, 2010). Biotreatment is use to convert organic pollutants into harmless metabolites or to mineralize the pollutants into carbon dioxide and water (Alexander, 1999). Microalgae have many roles in biotreatment and are widely used to remove different aquatic pollutants (Hwang *et al*, 2016). Specifically, greenalgae is used in transforming and degrading congo red and removing these compounds from the environment (Gupte *et al*, 2016). They have been used to degraders recalcitrant pollutants such as *Chlorella vulgaris* (Vimonses *et al*, 2009).

Congo red (CR) is a benzidine-based, direct, anionic diazo dye prepared by coupling tetrazotised benzidine with two molecules of napthionic acid. Congo red is the first synthetic azo dye produced that is capable of dying cotton directly. Congo red containing effluents are generated from a number of industrial activities: textiles, printing and dyeing, paper, rubber, plastics industries (Purkait *et al*, 2007; Mittal *et al*, 2009). Exposure to the dye has been known to cause allergic reactions. The substance is considered as toxic exhibiting acute, algal, bacterial, protozoan, cutaneous, environmental, microbial, yeast toxicity; cytotoxicity; genotoxicity; hematotoxicity; neurotoxicity, as well as carcinogenicity and mutagenicity (Han *et al*, 2008; Sabnis, 2010; Shu *et al*, 2015).

The capability of CR to form carcinogenic amines such as benzidine through cleavage of one or more azo groups is the reason why it falls under the category of banned azo dyes (Raymundo *et al*, 2010). The recalcitrance of CR has been attributed to the presence of aminobiphenyl group and azo bonds, two features generally considered as xenobiotic (Pielesz, 1999; Sponza and Isik, 2005).

MATERIALS AND METHODS

Culture and algal growth

The unicellular green microalga *C. vulgaris* (Aksmann and Tukaj, 2008) was grown on Chu-10 (Chia *et al*, 2013) for 15 days under constant laboratory conditions at 25±2°C and a light system of 16:8 hours light/ dark (Pinheiro *et al*, 2004). This culture transported into 1000 ml of media and incubated for 14 days to increase of algal biomass (Chia *et al*, 2013).

Experimental design

Chlorella vulgaris (100ml) was cultured in 1 liter