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Adsorption study of metribuzin pesticide on fungus *Pleurotus mutilus*

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The aim of the present work is the valorization of the biomass *Pleurotus mutilus* fungal biomass in the biosorption of metribuzin pesticide. The present study constitutes of two principal parts. The first part includes physical pretreatment and structural characterization of the biomass. In the second part, different parameters likely to have an influence on the biosorption capacity of metribuzin such as biomass, particle size, biosorbent content, agitation, temperature, pH and metribuzin concentration were studied. The results of adsorption experiments obtained for synthetic water were convincing, and an adsorption rate of metribuzin of approximately 70% was reached for the following optimum conditions: particle size [250e400 mm], pH ¼ [2e3], biomass content 3 g, agitation of 250 rpm, temperature of 25 °C, and initial concentration of metribuzin ¼ 200 mg L^{-1}.

1. Introduction

The wide use of pesticides gives rise to serious ecological problems, owing to their negative environmental effects (Cohen et al., 1984; Thiemann et al., 1991; Behloul et al., 2013). The contamination of surface and ground water by pesticides is a matter of concern for the scientists over a period of years.

Metribuzin is one of the most organometallics herbicides used in Algeria as well as all over the world. This pesticide has largely substituted the chlorinated hydrocarbons due to their lack of affinity for lipid tissues and their comparative non persistence in soils (Tireche et al., 2012; Réévaluation de la Metribuzine, 2005; Kitous et al., 2012, 2016).

Metribuzin is a synthetic organic compound. It is a selective triazinone herbicide used primarily to discourage the growth of broad leaf weeds and annual grasses among vegetable crops and turf grass. Metribuzin accomplishes this by inhibiting electron transport in photosynthesis. Common uses include application to soybeans, potatoes, alfalfa, sugarcane, barley, and tomatoes (Papadakis and Papadopoulou-Mourkidou, 2002; Tomlin, 2000).

Many processes have been proposed for metribuzin removal from water and groundwater. Electrochemical treatment, ultraviolet oxidation, electro-activated granular carbon, and membranes techniques are among the most commonly used methods; each has its merits and limitation in application (Plakas et al., 2006; Ikeura et al., 2011; Yahiaoui et al., 2011).

The biosorption is currently considered as an alternative process for pesticide pollutant elimination (Mushtaq et al., 2016).

Different types of adsorbents like plants, activated carbon, carbon cloth, bacteria, straw (Lan et al., 2004) have been used in the case of metribuzin removal. The present study proposes the use of a new biosorbent, *Pleurotus mutilus* (mycelial basidiomycetes) for the treatment of water charged with metribuzin pesticide. The biomass constitutes a solid waste the SAIDAL, pharmaceutical industry, unit of Medea (Algeria) and proved its efficiency for the treatment of waters charged with heavy metals (Bal et al., 2003).

In the present study biosorption of metribuzin on *Pleurotus mutilus* is investigated. Characterization of the biosorbent structure was done using infrared spectroscopy. The biosorption tests were carried out in a batch mode. Several parameters like particle size, biosorbent content, agitation, temperature, and pH were optimized.

2. Materials and methods

Metribuzin ($C_8H_{14}N_4OS$) is a white crystalline solid with a melting point of 126 °C. Pure metribuzin is soluble in water up to 1200 ppm (1.2 g/L). Metribuzin has a slight sulfurous odor. It is reported to have a vapor pressure between 5 and 10 mm Hg at 20 °C

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