PHYTOREMEDIATION POTENTIAL OF MTBE FROM WATER RESOURCES BY LAVANDULA

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ABSTRACT

Methyl tertia butyl ether (MTBE) is an organic compound with widespread used in unleaded gasoline. Although the using MTBE had some environmental advantages, it was soon cleared that this compound has adverse effect on environment and human health. Different methods have been introduced for treatment of MTBE from groundwaters. These methods are generally expensive and inefficient. Phytoremediation introduce as an effective and inexpensive technology for removal of MTBE from groundwaters and soils. In this work, the ability of Lavandula vera for removal of MTBE from water has been investigated.

The plants were put in to the isolated water vessels containing a solution of MTBE with a concentration of 2000 at greenhouse condition. The water samples were analyzed for MTBE and transpiration was calculated. The mass balance method was used for estimate of the ability of the plant for removal of MTBE from the aqueous media. MTBE mass reduction of 34.86% was obtained due to the action of this plant and the volume of water transpiration was 43.33 cc in a week. High degree of removal MTBE by Lavandula vera in a short time indicates the great potential for phytoremediation of MTBE by this plant.

Key Words : MTBE, Lavandula vera, Phytoremediation, Unleaded gasoline

INTRODUCTION

Methyl tertia butyl ether (MTBE) is an organic compound with widespread used in unleaded gasoline and it is the most common oxygenate added to unleaded gasoline in Iran. MTBE is a colorless, flammable and combustible liquid. The molecular mass of that is 88.15 gr/mole and its water solubility is 51000 mg/lit. Although the using MTBE had some environmental advantages so reduce vehicular carbon monoxide and ozone precursor emissions in to the atmosphere, it was soon cleared that this compound has adverse effect on environment and human health¹. MTBE is highly soluble in water, it binds weakly to soil and doesn’t readily biodegrade in the environments so it is known as a contaminate in environment especially for groundwater resources²-⁴. MTBE is a known animal carcinogen and a possible human carcinogen⁴ moreover it has some noncancer effects. The U.S. Environmental Protection Agency (U.S.EPA) has classified MTBE as a human carcinogen³. Different methods have been introduced for treatment of MTBE from ground waters. These methods are generally expensive and inefficient. Phytoremediation

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introduce as an effective and inexpensive technology for removal of MTBE from ground waters and soils\textsuperscript{5}. Plant uptake, enhanced biodegradation and metabolically transformed in plant are several processes in phytoremediation. MTBE in the air has shorter half life in comparison with that in subsurface. In plant uptake MTBE is transferred from subsurface to the air during evapotranspiration by plant. The ability of plant species is very important in phytoremediation\textsuperscript{6}.

**AIMS AND OBJECTIVES**

The aim of this work is to examine the potential of *Lavandula vera* for removal of MTBE from water.

**MATERIAL AND METHOD**

*Lavandula plant* was selected for this experiment because it can be able to uptake water easily, easily reproduced and it is suitable for Iran ecological condition. The two years old plants were put in to the isolated water vessels containing a solution of MTBE with a concentration of 2000 in hydroponics system. The period of the experiment was 7 days at greenhouse condition in Ardestan University. The water samples were analyzed for MTBE by GC technique and transpiration was calculated by gravimetric method. The mass balance method was used for estimate of the ability of the plant for removal of MTBE from the aqueous media. The blank solutions without plant were used and the blank results correction of analytical data.

**RESULTS AND DISCUSSION**

MTBE mass reduction of 34.86\% was obtained due to the action of this plant and the volume of water transpiration was 43.33 cc in a week. High degree of removal MTBE by *Lavandula vera* in a short time indicates the great potential for phytoremediation of MTBE by this plant. In the field condition it could be a suitable plant for removal MTBE in the soil before MTBE gets to groundwater. The investigation showed that reduction of MTBE from soils can be achieved by using this plant. Concerning to this fact that this plant develops root system in top soil, it could be used in removal of MTBE instantly after pollution. In landscape designs and in the cases that MTBE is to be transferred in to the ground waters, this plant can be used for removal of MTBE after the pollution. In addition this plant can be able to removal MTBE from runoff and surface water before it receives from soil to groundwater.

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**REFERENCES**