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Efficacy of Water Mimosa (*Neptunia oleracea* Lour.) in the Treatment of Wastewater from Distillery Slops

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The quality of water contaminated with distilled slop was evaluated after treatment with water mimosa (*Neptunia oleracea* Lour.). The experiments were done in artificial housing and were carried out in 5 x 3 factorial arrangements with four replications for the water quality indicators, the biomass of water mimosa and heavy metal contamination. Concentrations of 0% (control), 5%, 10%, 15% and 20% distilled slop in contaminated water at 10, 20 and 30 d treatment periods were evaluated. The initial biomass of the water mimosa for all treatments was 0.200 kg per 50 L of effluent.

The removal efficiency of soluble solids at all concentrations of distilled slop and treatment time was 89.3–96.3%. The removal efficiencies of biological oxygen demand and chemical oxygen demand at all concentrations of distilled slop were optimal at 10 d treatment (42.9–70.4% and 8.27–25.0%, respectively); higher efficiency was obtained when the concentration of the distilled slop decreased from 20% to 0%. The removal efficiency of total dissolved solids and total kjeldahl nitrogen and the pH neutral control efficiency were not found in this study. pH, total dissolved solids and total kjeldahl nitrogen increased with treatment time and with an increase in the concentration of distillery slop.

The biomass of water mimosa at all concentrations of distilled slop increased at 10 d but tended to decrease with longer treatment period and an increase in the concentration of the distilled slop. The biomass of water mimosa at all concentrations of distilled slop was higher than that of the control at all treatment times. Nitrogen volatilization and transformation affected the kjeldahl nitrogen (KN) removal rate of distilled slop at all concentrations, whereas adsorption of nutrients in the water mimosa had no effect on the KN removal rate because the death rate of water mimosa was high. The concentration of the heavy metals Pb, Cd and Hg in water contaminated with distilled slop was acceptable. Based on our results, water mimosa may be used to treat water contaminated with distilled slop, but the concentration of the slop should not be more than 5%.

Key Words: biomass, distilled slop, heavy metal, treatment, water mimosa, water quality

Abbreviations: BOD – biological oxygen demand; COD – chemical oxygen demand; KN – kjeldahl nitrogen; MSTA – The Ministry of Science and Technology's Announcement, Thailand; SS – suspended solids; TDS – total dissolved solids; TKN – total kjeldahl nitrogen

INTRODUCTION

The liquor industry in Thailand has grown continuously over the years, with a 31% increase in the distribution of 28 degree white spirit, 28 degree mixed spirit, special blend liquor and special blend whisky. In 2003, about 1,010 million L of liquor were produced from distilleries; this amount increased to 1,324 million L in 2004 (Excise Department 2005).

Distilled slop is a waste by-product from the distillery process. Slop quantity was estimated to be 3.50 times of 28.0 degree white spirit production (Panapawuttikul 1984), thus 1 L of 28.0 degree white spirit produced 3.5 L of distilled slop. In terms of the total liquor distribution in Thailand in 2004, about 4,000 million L of distilled slop were produced. The chemical characteristics of distilled slop usually depend on the raw materials used in the distillery process. In general, the distilled slop has a potential of hydrogen (pH) of 4.10–4.50, a biological oxygen demand (BOD) of 35,000–40,000 mg L^{-1}, total solids of 120,000 mg L^{-1}, a nitrogen (N) content of 2,000 mg L^{-1}, P_2O_5 of 200 mg L^{-1} and K_2O of 4,000 mg L^{-1} (Panapawuttikul 1999).