

Chitsanuphong Pratum 2014: Treatment of Traditional Thai – Fermented Rice Noodle (Khanomjeen) Plant Wastewater by Effective Microorganism Together with Natural Treatment. Doctor of Philosophy (Environmental Science), Major Field: Environmental Science, Department of Environmental Science.

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The purpose of this study was to develop and determine an optimum condition of wastewater treatment from traditional Thai – fermented rice noodle plant using isolated effective microorganism together with natural treatment. This study was divided into 2 phases. The 1<sup>st</sup> phase was primary wastewater treatment using isolated microorganism from traditional Thai – fermented rice noodle plant wastewater by determining an optimum culture condition and biological wastewater treatment in bioreactor size 54 L. The 2<sup>nd</sup> phase was secondary wastewater treatment using natural treatment by the continuous flow condition and 5-days stagnation and 2-days releasing condition experiments were performed in glass column which packing with growing materials (gravel, coarse sand fine sand, and mixed soil and sand in ratio 1:3 from bottom to top) and the filtrated lysimeter technique was conducted in plastic tank size 30 L with growing treatment plants (vetiver grass and sedge). The results from 1<sup>st</sup> phase, it was found that nine *Bacillus* strains predominantly outgrown in wastewater were isolated and characterized. The isolated KJP3 and KJP8 from nine *Bacillus* strains were high degradation soluble starch on agar plates. After that, the isolated KJP3 and KJP8 were quantitatively tested for wastewater treatment in the artificial wastewater. The results revealed that the isolated KJP8 had the highest efficiency of COD removal at  $67.97 \pm 0.02$  %. Finally, analysis of 16S rDNA gene sequence revealed that the isolated KJP8 had high homology to *Bacillus subtilis* with 100% similarity. For the optimum culture condition found that at pH 6.0 and monosodium glutamate 0.1 g per 100 ml of wastewater can be stimulated growth of *Bacillus subtilis* KJP8. In case of, wastewater treatment in bioreactor showed that *Bacillus subtilis* KJP8 had the highest efficiency of COD removal at  $77.28 \pm 3.16$  % under aeration condition in flow rate 2 liter/min. The 2<sup>nd</sup> phase of wastewater treatment, the results revealed that the 5-days stagnation and 2-days releasing could be reduced COD from 801.60 to  $40.44 \pm 14.44$  mg/l at the 1<sup>st</sup> treatment cycle and decreased to  $369.97 \pm 28.89$  mg/l at the 4<sup>th</sup> treatment cycle. Furthermore, the natural treatment with growing types of treatment plants (vetiver grass and sedge) were investigated to treat bio-treatment wastewater which COD value  $1,082.60 \pm 259.04$  mg/l. The results revealed that both plants gave nearly effective to remove COD and efficiency decreased follow to period of treatment cycles. At the 8<sup>th</sup> cycle of treatment (20 L/cycle), COD of effluent exceeded 400 mg/l which the limitation COD value of industrial effluent standard. Moreover, the treatment of real traditional Thai – fermented rice noodle plant wastewater by the natural treatment system was performed in order to compare. It was found that this system could treat only 2 cycles. Therefore, this developing treatment could be considered to apply for traditional Thai – fermented rice noodle plant wastewater treatment.

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Thesis Advisor's signature