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Physiochemical Characteristic of Sago (*Metroxylon Sagu*) Starch Production Wastewater Effluents

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Abstract - The physiochemical characteristics of sago starch production wastewater effluents was recently studied. Sago wastewater effluent samples were obtained from a sago factory located in Sarawak, Malaysia and sent to accredited laboratories for particle size distribution and water quality analyses. The findings of this study concluded that sago wastewater effluents from this region are whitish and greyish brown (pH 4.20) in color with majority supra-colloidal or settable suspended solids of particle size ranged from 4.477 µm to 1.18 mm (of 95% volume). The starch content of this wastewater effluents are less than 7% whilst the pollutant parameters (total suspended solids, biochemical oxygen demand and chemical oxygen demand) measured 10,900 mg/L, 5,820 mg/L and 10,220 mg/L, respectively. Pre-filtration of the wastewater effluents has resulted reduction of the pollutants content as high as 66% of total suspended solids, 20% of biochemical oxygen demand and 22% of chemical oxygen demand while improved pH in a range of 0.05-0.45%.

Index Terms - Sago factory wastewater effluents, particle size, total suspended solids, biochemical oxygen demand and chemical oxygen demand

1. INTRODUCTION

In Southeast Asia, approximately 60 million tonnes of sago (*Metroxylon Sagu*) starch are produced annually either by mechanical or traditional methods [1]. Plenty of average size sago mills are found in tropical countries and a study carried out by Bujang et al. (1996) to investigate the total water consumption and wastewater effluents production by the factories reported that approximately 600 sago logs are processed in one of the mills in Sarawak, Malaysia, daily and the water consumption during the operation is approximately 5 L/s (18 tonnes/h) whilst the wastewaters generated as the factory wastewater effluents are approximately 30 L/min (1.8 tonnes/hr) [2]. Therefore, approximately 237.6 tonnes of wastewater containing approximately 7.1 tonnes of total solids would be generated daily for an operation of 12 hours [2]. These wastewater effluents are not suitable to be reused and recycled in the process and thus the voluminous amount of wastewater would be discharge out of the facotry into nearby river. In Malaysia, it was reported that the amount of starch contained in sago pith solid waste and wastewaters accounted for nearly half of the total annual imports of starch of the year [3]. Again, the report stated that about the same amount of starch residues were being discharged into rivers as sago factory wastewater effluents. However, only a few of the factories implemented wastewater treatment facilities for environment conservation purposes. This is most probably due to the economical risk and unreliable treatment efficiency although they are aware of the need for such measures [4-6]. Therefore vigorous researches have been carried out to solve the predicament faced by local sago processing industries and the environmental governing authorities [3].

During sago starch extraction process, sago trunks are washed, debarked, rasped prior to hammer milling or pulping process (Fig. 1). The sago barks (20% of the total trunk weight) normally are sun-dried and utilized as firewood or transformed into various valuable products [7-12]. After rasping and hammermilling processes, the starch in the slurry are extracted and left to be settled, then compacted and agglomerated before being air-dried by using thermo-oil heating to turn them into powder form for marketing (Fig. 1) [13]. During the entire production process, large amount of water (20 litres of wastewater per kg of sago starch production) would be discharged as sago wastewater effluents which are rich in carbohydrates, fibres and dense suspended solids, unextracted starch, cellulose (fibrous residue from pith), nitrogenous compounds, cyanoglucosides and insoluble fibres [2, 5, 14-15]. These effluents, containing high concentration of organic matters (such as protein, lipids and carbohydrates), are reported to be acidic (pH 3.4 to 4.7; depending on the