AERATED SOAKING OF PADDY FOR RICE PARBOILING AND ITS EFFECT ON EFFLUENT KINETICS

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Parboiling is practiced to increase the milling performance and cooking quality of rice. The main steps in parboiling process are soaking, steaming and drying of paddy. Traditional cold soaking is one of the methods used for soaking in which the paddy is submerged in water for a period of 48- 72h. The effluent from this method is in poor quality and has the potential to pollute the environment, water bodies and lands. This study was carried out to find a solution to reduce the environmental impact of effluent release from parboiling process.

The effluents (traditional parboiling method – T_1) from five mills in Anuradhapura were collected and the colour, odour, turbidity, temperature, pH, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Solids (TS), and Total Suspended Solids (TSS) were measured. Alternatively two laboratory models were developed and tested for aerated soaking. In the first model (T_2) the water was trickled over the paddy at the rate of 1000ml/min and drained water was re-circulated to reduce the amount of water needed for soaking. In the second model (T_3) a charcoal filter was introduced before the re-circulation of water to study the effect of charcoal treatment in the effluent. The effluent samples from T_1, T_2 and T_3 were incubated at 20^0C and Dissolved Oxygen (DO) was measured in 12h intervals for 5 days to calculate BOD values. DO was measured using Winkler titration method. The rate constants were estimated from the BOD curve developed for the three treatments.

Average temperature, pH, COD, TS and TSS values of the effluent of T_1 were 38^0C , 6.1, 2548 mg/l, 150 mg/l and 50 mg/l, respectively. The effluent from T_1 also had the highest mean BOD value (2452 mg/l) at the end of 5 days, unpleasant colour and odour though the degree of contamination varied among the mills. These results indicate the potential of the effluent of the traditional method as a pollutant. Effluents of the laboratory models (T_2 and T_3) recorded much lower BOD values at the end of 5 days (356 and 128 mg/l, respectively) with no unfavorable colour or odour. T_3 recorded the lowest rate constant (0.07 per day) when compared with T_1 and T_2 (0.28 and 0.15 per day, respectively).

In the aerated soaking methods (T_2 and T_3) tested, water can be recycled. In addition, the soaking time needed to absorb water up to optimum moisture content was less in T_2 and T_3 compared to that of traditional method. Eating quality of rice was also observed to be high with the aerated models than with the traditional method.

Power requirements and cost – benefit analysis have to be studied to improve the aerated soaking system in mills. Further studies are necessary to identify carbonaceous and nitrogenous demand in the BOD curves of the models considered. Further understanding on the kinetics of effluent can lead to design more efficient aerated soaking and effluent treatment reactors.