



Comparative examination of leaching kinetics of soluble solids and effluent characteristics in different soaking processes of paddy parboiling

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ABSTRACT

Paddy was soaked with 30% moisture, and hot water soaking (35, 40, 45, 50, 55, 60 °C) was compared to cold soaking (CS) and submerged aerated soaking (SAS) in terms of the parameters of the paddy grain and the effluent. The investigation demonstrated that hot water soaking yielded the highest total solids (TS) (1.946 ± 0.045 g/L), total dissolved solids (TDS) (1.724 ± 0.013 g/L), and electrical conductivity (EC) (2.651 ± 0.039 mS/cm) values. Elevated dissolved oxygen (DO) (3.72 ± 0.04 mg/L) was observed in the hot water soaking (60 °C) due to the reduction of soaking duration (2 h). By contrast, the SAS maintained a nearly neutral pH (7.35 ± 0.01) and lower turbidity (510.0 ± 1.4 NTU) level compared to the hot water soaking. The leaching rates and moisture absorption were computed using Pseudo-second-order and Peleg models, and a higher leaching rate (0.081 g/L min) was detected at 60°C. The SAS produced higher efficiency with less resource consumption by reducing effluent strength while maintaining TS in paddy grains. The new knowledge created by the comprehensive evaluation CS, SAS, and hot water soaking of paddy parboiling using leaching models and paddy hydration adds new insights to the development of efficient paddy parboiling methods.

Key words: absorption kinetics, effluent quality, leaching kinetics, paddy, soaking methods

HIGHLIGHTS

- Wastewater from paddy parboiling pollutes the environment significantly.
- Effluent strength in hot water soaking is very high compared to cold water soaking and submerged aerated soaking.
- Submerged aerated soaking reduces effluent quantity and strength greatly.
- The new knowledge created by this comparative work facilitates the development of appropriate soaking methods for paddy parboiling.