REMOVAL OF POLLUTANTS IN PARBOILED PADDY WASTEWATER

MASTER OF SCIENCE

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UNIVERSITY OF MORATUWA
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DECLARATION

I certify that this dissertation does not incorporate any material previously submitted for any degree or diploma in any university without stating the references to the best of my knowledge and belief and it does not contain any material previously published, written or orally communicated by another person without acknowledgement.

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H.W.G.I. Karunaratne

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I endorse the declaration by the candidate.

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Supervisor

Dr. M.Y. Gunasekera

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ABBREVIATIONS

BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
FAU	Formazin Attenuation Units
GAC	Granular Activated Carbon
RPRDC	Rice Processing Research and Development Centre
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TSS	Total Suspended Solids
VSS	Volatile Suspended Solids

ABSTRACT

Parboiling is a widely used paddy processing method where paddy is soaked in water to hydrate before the subsequent steaming, drying and milling operations. A significant amount of water is used in this soaking operation which is then discharged as wastewater. The continuous discharge of this wastewater has become an environmental concern in the paddy parboiling industry in Sri Lanka.

In this study important characteristics of the effluent generated from two existing paddy soaking operations practiced in Sri Lanka namely hot soaking and cold soaking were initially determined. This analysis was done for wastewater resulting from soaking two rice varieties available locally, namely LD 356 a red rice and BG 300 which is a white rice. Characterization study showed pollutant levels higher in paddy soak wastewater than the stipulated local discharge standards (Appendix C). Wastewater generated from both hot soaking and cold soaking of red rice variety showed relatively higher COD and BOD values compared to those of wastewater from white rice variety. Hot soaking wastewater had higher COD and BOD values than cold soaking wastewater. The wastewater generated from hot soaking of red rice which showed higher pollutant strength is further studied for pollutant removal methods.

Biological treatment methods such as aerobic, anaerobic and physical treatment methods such as coagulation and adsorption were investigated. Removal of pollutants by aquatic plants and biological treatment using various microbial seeding sources such as cow dung, rice straw, pond water and paddy field soil were also studied. Results show that microbial sources from pond water and paddy field soil were able to reduce COD in soak wastewater by 96% and 94% respectively at pH 8 under aerobic and dark conditions. Combined treatment of anaerobic digestion and coagulation was able to reduce 94% COD while the combination of adsorption and coagulation reduced COD by 92%. Treatment of a wastewater sample collected from a paddy parboiling rice mill in Marandagahamula area using pond water as the microbial source showed a 93% COD reduction.