

Multiobjective optimization of parboiled rice quality attributes and total energy consumption

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Abstract

This study was designed to investigate, model and optimize the effect of process factors (soaking temperature, soaking time, steaming time and paddy moisture content) on rice quality attributes and total energy consumption of a commercially grown rice variety (FARO 60) using response surface methodology. The optimum processing conditions obtained for the rice quality attributes and total energy consumption varies from one another. The milling recovery, head rice yield, white bellies, lightness, colour, and total energy consumption values of the parboiled rice ranges from 68.46 - 72.34%; 67.71 - 71.42%; 0.50 - 4.30%; 22.03 - 33.00; 14.10 - 21.21 and 45.27 - 73.68 MJ, respectively. The second-order polynomial models were observed to be fit in predicting milling recovery, head rice yield, white bellies and total energy consumption with the coefficient of determination (R^2) that range from 78.71 to 95.03% while colour and lightness values were not fit with R^2 ranging from 24.05 to 52.95%. The multi-objective optimization for desirable parboiled rice quality attributes and total energy consumption showed that universal optimum condition was found at 64°C soaking temperature, 11 h soaking time, 35 min steaming time and 17% paddy moisture content. The approach used and information obtained from this study would be useful for rice processors as a strategic means of minimizing total energy consumption, without compromising its desirable quality attributes.

Keywords: Multiobjective Optimization; Parboiled Rice Quality Attributes; Total Energy Consumption

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