

DRYING CHARACTERISTICS AND QUALITY OF PADDY EXPOSED TO INFRARED RADIATION

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Paddy is a vital staple food that provides the world's dietary energy supply, but its high moisture content challenges post-harvest management. Infrared radiation (IR) heating is a promising solution for drying paddy, with benefits such as uniform heating, reduced processing time, and improved product quality. This research evaluates the effect of different IR temperatures on the drying quality of paddy. IR experimental set-up was built using a 1000 W ceramic IR emitter and a ceramic plate. A temperature control system was developed with a Raspberry Pi 4 B and Python 3.7 programming language. The study used freshly harvested paddy (Bg 300 -length 8.22 ± 0.01 mm, width 2.92 ± 0.02 mm, thickness 2.05 ± 0.01 mm) with an initial moisture content of $18.02\pm0.39\%$ (wet basis). The paddy was dried at four different temperatures: $62.19\pm0.00^{\circ}\text{C}$, $81.91\pm0.01^{\circ}\text{C}$, $104.74\pm3.09^{\circ}\text{C}$ and $131.62\pm3.22^{\circ}\text{C}$ with respective exposure times 1380 s, 480 s, 150 s, and 120 s while maintaining a consistent bed thickness (11 ± 0.82 mm) until the final moisture content was $12.36\pm0.09\%$ (wet basis). The considered paddy quality assessment parameters were Head Rice Percentage (HRP), Total Milling Yield (TMY), and Whiteness Index (WI). ANOVA test was conducted using Minitab 19.1. The HRP values for temperatures 62.19°C , 81.91°C , 104.74°C and 131.62°C were $34.1\pm0.9\%$, $26.02\pm1.8\%$, $26.06\pm0.80\%$ and $14.00\pm0.91\%$, respectively. The corresponding TMY values were $69.29\pm0.13\%$, $57.58\pm0.92\%$, $64.2\pm0.46\%$, $70.97\pm0.89\%$ and WI values were 67.67 ± 0.18 , 68.28 ± 0.895 , 67.675 ± 0.825 and 65.525 ± 0.025 . The results indicated that the drying temperature significantly affects ($p\leq0.05$) HRP and WI but not the TMY of the paddy. Further, the results indicated that increasing the drying temperature reduces the time to obtain the required final moisture content. In conclusion, the time for drying paddy and the quality of paddy changes with different IR temperatures.

Keywords: Grain processing, Moisture content, Milling quality, Raspberry Pi