Dissertation Title	Production of Healthy Coated Rice by Top-Spray Fluidized Bed Coating Technique
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Candidate	Mr. Arkom Palamanit
Dissertation Advisors	Prof. Dr. Somchart Soponronnarit
	Assoc. Prof. Dr. Somkiat Prachayawarakorn
	Mrs. Patcharee Tungtrakul
	Prof. Dr. G.S. Vijaya Raghavan
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Faculty	School of Energy, Environment and Materials
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Abstract

Coating of white rice kernels with natural antioxidant to produce healthy coated rice can improves the functionality of white rice. Curcuminoids in turmeric rhizomes are phenolic compound that possess high antioxidant activity and heat stability. The top-spray fluidized bed coating (TSFBC) is a coating technique that combines the steps of coating and drying in one unit operation. Thus, coating of white rice kernels with turmeric extract using the TSFBC is investigated in this study. The objective of this study was therefore to study the effects of inlet fluidizing air temperature, spray rate of coating solution, superficial air velocity, atomization air pressure and percentage of recycled exhaust air on the quality of TECR and the performance of TSFBC.

The experimental results showed that the inlet fluidizing air temperature, spray rate of coating solution and percentage of recycled exhaust air strongly affected the final moisture content and the number of fissured kernels of TECR. The superficial air velocity and atomization air pressure slightly affected the final moisture content of TECR. All kernels of TECR were fissured when the final moisture content of TECR was lower than 11.80% wet basis (w.b.). The operating conditions slightly affected the head coated rice yield of TECR. The spray rate of coating solution and superficial air velocity affected the redness value of TECR. The superficial air velocity, atomization air pressure and percentage of recycled exhaust air had effect on the coating efficiency and the number of uncoated white rice kernels. Coating at superficial air velocity of 2 m/s resulted not only in lower coating efficiency of TSFBC than 80% but also led to high number of uncoated white rice kernels. When the superficial air velocity was increased to 2.5 or 3 m/s, the coating efficiency of TSFBC was higher than 80% and the number of uncoated white rice kernels was significantly decreased. At the superficial air velocity of 2.5 or 3 m/s, the atomization air pressure and percentage of recycled exhaust air insignificantly affected the coating efficiency. Coating at 80% recycled exhaust air could save the energy consumption of electric heater (SEC_{heater}) by about 41.7-46.5%. After cooking TECR, the hardness and stickiness of cooked TECR insignificantly changed from cooked white rice kernels. The total phenolic content (TPC) and total antioxidant capacity (TAC) of TECR depended on the spray rate of coating solution. The retention of curcuminoids, TPC and TAC remained higher than 90% after cooking.

Based on these experimental results, it is suggested that production of TECR using TSFBC to obtain high coating efficiency, proper energy consumption and good TECR quality. The TECR that has good quality should has uniform color, less number of

uncoated white rice kernels and low number of fissured kernels. Moreover, the final moisture content, head coated rice yield and cooking quality of TECR should be similar to the white rice kernels before coating. Thus, the TSFBC should be operated at the superficial air velocity of 2.5 m/s, inlet fluidizing air temperature of 50 °C, spray rate of coating solution of 40 mL/min, spraying time for 12 min, atomization air pressure of 1 bar and 80% recycled exhaust air.

Keywords: Coated Rice/Fluidized Bed Coating/Functional Foods/Healthy Foods/Turmeric