

Title Reducing cracking and breakage of soybean grains under combined near-infrared radiation and fluidized-bed drying

Author Sakchai Dondee, Naret Meeso, Somchart Soponronnarit and Sirithon Siriamornpun

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Abstract

Near-infrared radiation was combined with fluidized-bed drying to reduce the cracking and breakage of soybean grains because of its advantages such as a decrease in the moisture gradient and the stresses development within the grain kernel, leading to high quality of product. Physical qualities, i.e. cracking, breakage and colour, were investigated together with microstructure of soybean grains. Protein solubility and urease activity were also determined. The parameters studied were near-infrared radiation powers of 4, 6 and 8 kW, air velocity of 4.5 m/s, air temperature of 40 °C and grain bed depth of 6 cm. Results showed that the drying rate was increased with the increase of near-infrared radiation power. The moisture content was reduced from an initial moisture content of 20% d.b. to the final moisture contents of 13.5% d.b. (4 kW), 12.8% d.b. (6 kW) and 12.5% d.b. (8 kW). The cracking and breakage of soybean grains occurred negligible, which was lower than 4.4% and 5.3% for cracking and breakage, respectively. At near-infrared radiation powers of 4 and 6 kW was accepted for both soybean grains trade and animal feed industries in Thailand. The total colour difference changes (ΔE) were varied in the range of to 2.9–4.2. The protein solubility of final product was in an acceptable range (77–82%) for feed meal. The reduction of residual urease was varied in the range of to 39–70%. This study has demonstrated that the soybean grains under combined near-infrared radiation and fluidized-bed drying was properly treated.