

Deep bed bulk drying characteristics of black gram

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Abstract

Deep bed drying of black gram using a bulk drier is a quick and efficient method which can reduce postharvest losses and prevent environmental contamination into the grain mass. The objective of this research was to study the effect of drying air temperatures (40, 50 and 60°C), grain initial moisture contents (14, 17 and 20%w.b.) and drying air flow rates (11 and 22 m s⁻¹) on the bulk drying characteristics of black gram. The drying experiments were carried out in a deep bed dryer, which was designed and fabricated at IICPT, with a depth-to-diameter ratio of 2:1 and capacity of 250 kg. The drying condition for each experiment was one of the combinations of the initial moisture contents, drying air temperatures and air flow rates. During drying, the moisture content of the dried gram (%w.b.) were determined from grain samples collected at 1 h intervals from three distances (0.3, 0.15 and 0.05 m) from the wall of the drying bin and at five depths (0.0, 0.3, 0.6, 0.9 and 1.2 m) of the drying bin. The black gram was dried accordingly to find the drying characteristics at the different depths. As the temperature increased, the drying zone moved towards the top layer rapidly. The grain temperature reduced with increases in the bed depth and the initial grain moisture content. The grain moisture content decreased as the drying time increased until the drying zone reached the top layer. When the drying zone reached the top layer, the influence of air velocity on moisture removal was meager, irrespective of air temperature and initial grain moisture content. It can be concluded that the deep bed drying of black gram was affected by initial moisture content of gram, drying air temperature and air velocity.

Keywords: lack gram, deep bed dryer, bulk drying characteristics, temperature and moisture content profiles