

Effect of moisture content on selected physical properties of wheat

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ABSTRACT

The investigation was undertaken to study the effect of moisture levels on the selected physical properties such as size, sphericity, true density, bulk density, porosity, angle of repose and coefficient of friction of wheat seed (*Triticum aestivum*, variety Lok – 1.). The size of seed at 10 ± 0.5 per cent (w.b.) moisture level was minimum (0.425 cm) and thereafter it increased to 0.451 cm at 30 ± 0.5 per cent (w.b.) moisture level, whereas the sphericity was highest (0.605) at 30 ± 0.5 per cent and lowest (0.573) at 15 ± 0.5 per cent (w.b.) moisture levels. The true density was observed highest (1602.60 kg/m³) at 10 ± 0.5 per cent (w.b.) and lowest (1231.60 kg/m³) at 30 ± 0.5 per cent (w.b.) moisture levels. The change in true density at every 5 per cent (w.b.) moisture level was in between 24 to 271 kg/m³. The bulk density was found highest 869.00 kg/m³ at 10 ± 0.5 per cent (w.b.) and lowest 741.00 kg/m³ at 30 ± 0.5 per cent (w.b.) moisture levels. Thus it is concluded that true density and bulk density decreases with increase in moisture content. The porosity per cent was highest (45.70 per cent) at 10 ± 0.5 per cent (w.b.) and lowest (35.50 per cent) at 20 ± 0.5 per cent (w.b.) moisture levels. The porosity per cent decreases with increase in moisture content upto 20 ± 0.5 per cent (w.b.) moisture content and there after increases. The highest value (36.809 degrees) of angle of repose was found at 30 ± 0.5 per cent (w.b.) and lowest (25.047 degrees) at 10 ± 0.5 per cent (w.b.) moisture levels. The coefficient of friction was highest (0.696) for asbestos surface at 20 ± 0.5 per cent (w.b.) and lowest (0.351) for glass at 10 ± 0.5 per cent (w.b.) moisture levels.

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Among the engineering properties the physical properties of wheat-seed are important in agricultural process engineering for the post harvest operations. As the wheat seeds undergo various treatments with moisture during its processing from Biscuits to Beers, Noddles to Sphagetti and Pasta to *Chapaties*, the behaviour of physical properties with respect to moisture content is essential. The size, sphericity, bulk density, true density, porosity, angle of repose and coefficient of friction are fundamental properties required in the analysis of various operations in respect of separations, drying, handling and conveying of wheat seeds. These are used in the design, construction of storage bins, handling equipments, hoppers, batch driers, indent and disc separators, spiral separators, conveyers, etc. (Shepherd and Bhardwaj, 1986).

METHODOLOGY

The variety of wheat seed used during the experiment was Lok-1 (*Triticum aestivum*).

Cleaning and grading :

The seeds were cleaned and graded using standard mesh sieves. The scalper screen or top sieve for cleaning was ASTM-4 (4.750 mm) while the grader screen or bottom sieve was ASTM-8 (2.399 mm). The wheat seeds retained between the scalper and grader screen were

selected for investigations.

Sampling and replicating :

The seed was sampled by weighing 800 gm cleaned and graded wheat seed on electronic weighing balance with an accuracy of 0.1 gm. The seed was kept in polythene bags for storage. The samples were replicated thrice.

Determination of moisture content :

The initial moisture content was determined by direct method of air oven drying with single stage moisture determination. Weighed product of finely ground grain was heated in an air oven for one hour at $130^{\circ} \pm 1^{\circ}\text{C}$ and from the loss in weight, the moisture content in the product was determined by the following formula :

$$\text{Per cent moisture} = \frac{\text{Loss in weight of sample}}{\text{Initial weight of sample}} \times 100$$

The initial moisture content of the wheat seeds was found 8.5 per cent. The experiment was conducted in the moisture range of 10 to 30 per cent (w.b.).

Conditioning :

To condition the sample for lower moisture content, the wheat seeds were dried in mechanical ventilated drier