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Research Paper :

Study of moisture based physical properties of Indian bean

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ABSTRACT

The objective of this study was to investigate some moisture dependent physical properties of the Indian bean, namely, physical dimension, size, sphericity, bulk density, thousand grain mass, true density, bulk porosity, angle of repose, grain volume, static coefficient of friction. The physical properties of Indian bean were determined at moisture level 9.77, 16.33 and 25.11per cent. The grain size and grain volume increased from 7.33 to 7.69 mm and 195 to 240 mm^3, respectively whereas, sphericity increased from 0.72 to 0.75 due to change in moisture content from 9.77 to 25.11 per cent (d.b). The bulk density and true density decreased from 833.66 to 738.2 kg/m^3 and 1282 to 1202.7 kg/m^3, respectively, while the bulk porosity increased from 34 to 38 per cent in the specified moisture content. The angle of repose increased from 29.18 to 32.21 degree and the static coefficient of friction varied between 0.24 and 0.41 with different material surfaces at the specified moisture level.

Key words : Indian bean, Physical properties, True density, Angle of repose

Now a days all developed and developing countries are boosting the production of pulses as it is very important to increase the amount of pulses in vegetarian diet. This needs better understanding of the properties for advanced applications in handling and processing. Only little is known about the basic physical characteristics and properties of agricultural products and of pulses in particular (Grover and Kumar, 1985). For developing a new innovative consumer product from Indian bean which is consumed in the form of dal in Maharashtra, although Indian bean is one of the minor pulse crop with productivity 400-500 kg/ha (Vadia *et al.*, 1998). Shape, size, volume, surface area, density, colour and appearance are some of the physical characteristics in combination with moisture content need understanding to save energy. The handling and flow of the material requires better knowledge of the frictional properties, angle of repose etc. This all helps in design of belt conveyors, screw conveyors, etc. In view of above the study was undertaken to find out properties like size, shape, density, crushing load, colour, angle of repose, coefficient of friction for machine design purpose. The data on the moisture dependent physical properties of pulse grain is scanty. Therefore, the present study was undertaken to find out effect of moisture content on physical properties of Indian bean and to determine the varietals influence of Indian bean on physical properties.

METHODOLOGY

The present study on "Study of moisture based physical properties of Indian bean" was undertaken at Padmashree Dr. D.Y. Patil College of Agricultural Engineering and Technology, Talsande, Kolhapur. The Indian bean pulse grain sample commercially available variety was procured from local market. The photograph of these grains with various moisture levels is shown in Fig. 1, 2 and 3. These grains contained about 10 per cent moisture (d.b.). Thousand gram of sample was taken randomly for testing purpose. The damaged and faulty grains were removed manually. The test sample of Indian bean was sundried in order to reduce moisture content about 9.77 per cent (d.b.). The moisture content was measured by standard oven dry method. The sundried samples were moistened with calculated quantity of water by using equation 1 and conditioned to raise moisture

Fig. 1 : Test sample of Indian bean at 10 per cent moisture content