

Research Paper :

Study of moisture based physical properties of soybean

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Received : January, 2011; Accepted : February, 2011

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ABSTRACT

Some moisture based physical properties of soybean were determined in order to facilitate the design of processing equipments. In this study some of the physical properties of soybean such as grain size, sphericity, grain volume, thousand grain weight, true density, bulk density, bulk porosity, angle of repose, and static coefficient of friction were evaluated as a function of moisture content in the range of 7.37, 10.92, and 15.80 %. The grain size increased from 5.441 to 5.571 mm, grain volume increased linearly from 80 to 83.72 mm³, whereas sphericity increased from 0.8329 to 0.8415 due to change in moisture content from 7.37 to 15.80 % (db). The bulk density and true density were decreased from 749.1 to 644.4 kg/m³ and 1250 to 1111.11 kg/m³, respectively, while the bulk porosity was increased from 40.07 to 41.9 per cent in the specified moisture content. The angle of repose and thousand grain weight increased from 26.35 to 30.96 degree and 103.57 to 109.57 g, respectively as moisture content increased from 7.37 to 15.80%. The static coefficient of friction increased linearly against all the tested surfaces as moisture content increased.

Wandkar, Sachin V., Ukey, Pravin D., Acharyya, Souvik and Gholap, Babasaheb S. (2011). Study of moisture based physical properties of soybean. *Internat. J. Agric. Engg.*, 4(1) :60-63.

Key words : Soybean, Size and shape indices, Physical properties

Soybean (*Glycine max.*) is an important annual plant. The requirements for soybean used directly or indirectly for human consumption increases with population increase. It is estimated that soybean production in world is about 180 million tons per year. For the past several decades, production of soybean has steady increase in India. Soybean production in India has increased to 4.89 million tones. About 80% soybean production in India is in the State of Madhya Pradesh alone. The other states which grow significant amount of soybean are Maharashtra, Rajasthan, and Uttar Pradesh.

Soybean produces 2-3 times more protein per hectare than any other legume / pulse. It contains 40% protein, 23% carbohydrates, 20% cholesterol – free oil and reasonable amount of mineral and vitamins. It is chief constituent of soy-milk and also panir which makes a delicious milk product. In order to design equipment for handling, aeration, storing and processing of soybean its physical properties need to be known. Designing of such equipments and machines without taking these into considerations may yield poor results. The objective of this study was to investigate effect of moisture content on physical properties of the soybean, namely, physical

dimension, size, sphericity, bulk density, thousand grains mass, true density, bulk porosity, angle of repose, grain volume, static coefficient of friction. This information about physical properties of soybean is valuable not only to engineer's but also to food scientists and processors and plant breeders.

METHODOLOGY

Preparation of grain samples:

The test sample of soybean was sun dried in order to reduce the moisture content and the corresponding moisture content was 6.70-7.90 % (db). Sun dried samples were moistened with a calculated quantity of water by using equation 1 and conditioned to raise their moisture content to the desired two different levels. A predetermined quantity of tap water was added to the grain lot of 3 kg and was thoroughly mixed. These rewetted grain lots were sealed in high molecular high density poly ethylene bags, which were kept inside wet gunny bags for 24 hrs at room temperature.

$$W_1(100 + M_2) = W_2(100 + M_1) \quad \dots (1)$$

where,