

Physical properties of cashew nut shells

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■ **ABSTRACT** : The physical properties of cashew nut shells were studied as it is necessary in handling, drying, heating, CNSL extraction and other relevant processing operations. The physical properties of the cashew nut shell at moisture content of 10.16 per cent (wb) studied were size, surface area, bulk density, angle of repose, co-efficient of friction and terminal velocity. The cashew nut shells were classified into three sizes *i.e.* small, medium and large. The percentages of these sizes found in the commercially available sample of shells were 9.74 per cent, 77.46 per cent and 12.80 per cent, respectively. The average values obtained were 2410 mm², 314 kg/m³ and 4.91 m/s for surface area, bulk density and terminal velocity, respectively. The angle of repose of medium size shells (23.25⁰) was quite close to that of control (23.61⁰) sample of shells. The co-efficient of friction was observed maximum for mild steel surface.

■ **KEY WORDS** : Cashew nut shells, CNSL, Physical properties

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Cashew (*Anacardium occidentale*) is an important plantation crop of India. It is presently grown in an area of 9.23 Lakh hectares with production of about 7.0 Lakh tonnes (CEPC, 2012). This crop was introduced to India during the 16th century. The potential of this crop in the international trade was first realized by India in the early 1900s through the export of cashew kernels. India has the largest area under cashew and stands as the second largest producer of cashew in the world. Vietnam, Ivory Coast and Brazil are the competitors to India for cashew production and export (CEPC, 2012). Cashew processing, using manual techniques, was started in India in the first half of the twentieth century (Nagaraja and Balasubramanian, 2007). India is the first country to develop technology for the extraction of cashew kernels from raw nuts. Today, India is the largest processor and exporter of cashew in the world (Nagaraja and Balasubramanian, 2007; Swain *et al.*, 2007).

Maharashtra ranks first in the production and productivity of cashew nut among all the states of the country. The area under cashew in Maharashtra is about 1.75 lakh hectares and the production is 1.98 lakh MT. The productivity of cashew in Maharashtra is 1186 kg/ha compared to average value of 695 kg/ha for the country (CEPC, 2012).

The cashew nut consists of kernel 20 to 25 per cent, cashew shell 70-75 per cent and testa 2-5 per cent. Hence, the cashew nut shell and the testa are two major by-products of the cashew processing industry. 100 kg of cashew nut

processing generates about 70 to 75 kg of cashew nut shell. Shell contains 20-25 per cent oil. The shell of the nut contains a dark reddish brown viscous liquid. It is called the cashew nut shell liquid and it is popularly referred or abbreviated as CNSL (Rajpakse *et al.*, 1977).

The physical properties of biological materials are shape and size, bulk density, porosity, mass of seeds and friction against various surfaces. Physical properties of Agricultural material are useful for designing various material handling, storage and processing machineries. These properties have been studied for various crops such as nutmeg (Abdullah *et al.*, 2010); raw cashew nuts (Aware *et al.*, 2007; Balasubramanian, 2001; Ogunsina and Bamgboye, 2007); groundnut grains (Davies, 2009); castor nut (Olaoye, 2000); pistachio nut and its kernel (Polat *et al.*, 2007).

The published literature for the data on physical properties of cashew nut shells was not available despite an extensive search. These data would be useful in designing the cashew nut shell processing machinery and its relevant unit operation. Therefore, an investigation was carried out to determine physical properties of cashew nut shells.

The knowledge of physical properties of cashew nut shells is necessary in handling, drying, heating, CNSL extraction and other relevant processing operations. The physical properties of the cashew nut shell studied were size, surface area, bulk density, angle of repose, co-efficient of friction and terminal velocity.