

Research Paper :

Physical properties of finger millet (*Eleusine coracana*)

S.S. SWAMI AND S.B. SWAMI

Accepted : April, 2010

See end of the article for authors' affiliations

Correspondence to:

S.B. SWAMI

Department of Agricultural Process Engineering, College of Agricultural Engineering and Technology, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, RATNAGIRI (M.S.) INDIA

ABSTRACT

Physical and mechanical properties of finger millet (*Eleusine coracana*) are necessary for the design of equipment to handle, transport, process and store the crop. The physical properties have been evaluated as a function of grain moisture content varying from 13 to 48% (db). In this moisture range, true density increased from 1120 to 1130 kg/m³; the bulk density increased from 709 to 775 kg/m³. The porosity of the finger millet grain was found to increase from 13.00 to 41.72%. The geometric mean diameter increased linearly 1.608 to 1.822 mm. The sphericity of the finger millet grains were in the range of 0.960 to 0.987 for the grain moisture content varying from 13 to 48% (db). The surface area and the surface volume were in the range of 9.00 to 10.2 mm² and the surface volume was 2.8 to 3.2 mm³ and found to increase with the increase in moisture content of the grains.

Key words : Physical properties, True density, Angle of repose, Finger millet (*Eleusine coracana*)

Finger millet (*Eleusine coracana*) also known as *ragi*, *nachani* or *nagli*, is one of the important millets in India. Finger millet is extensively grown on hilly areas and southern part of India and is widely consumed in the form of dumping by vast section of people (Vidyavati *et al.*, 2004). Finger millet is a rich source of Ca (300-350 mg%), phosphorus (283 mg%) and Fe 3.9% (Gopalan *et al.*, 2000). It has a well-balanced amino-acid profile and is a good source of methionine, cystine and lysine. These essential amino acids are of special benefit to those who depend on plant food for their protein nourishment (that is most of Indian people). It also contains about 72% carbohydrates, a high proportion of which is in the form of non-starchy polysaccharides and dietary fibre, which helps in constipation, and lowering of glucose in blood. It is a rich source of vitamins *viz.*, thiamine, riboflavin, folic acid and niacin (Vidyavati *et al.*, 2004).

Finger millet serves as a staple food for the large number of people in Konkan region, who consume it in the form of unleavened bread and soup locally called as the *ambil* and *Papad*. Among the urban areas there is a problem of malnutrition such as obesity, heart diseases and diabetes mellitus are ever increasing for which *ragi* can be better suited staple cereal grain than any of the refined cereals such as rice or wheat (Vaidehi, 1980). *Ragi* is nutritionally comparable to rice or wheat and also very useful for preparation of low cost diet and ready to eat nutritious food product like *ragi malt puff*, *dumping*, *bhakri*, *ragi*, *halwa*, bread biscuits and cookies. Hence, finger millet offers many opportunities for utilization in diversified products due to its abundant production, cost

effectiveness and better nutritional qualities.

The grain is variable in shape, size and colour. It may be elliptical, oblanceolate, hexagonal or globular in shape and grayish white or red in colour. The physical properties of finger millets like those of other grains and seeds, are essential for the design of equipment for handling, harvesting, processing and storing the grain. They affect the conveying characteristics of solid materials by air or water and cooling and heating loads of food materials (Sahay and Singh, 1994). It is therefore necessary to determine these properties. The properties of different types of grains have been determined by other researchers (Shepherd and Bhardwaj, 1986; Dutta *et al.*, 1988; Joshi *et al.*, 1993; Singh and Goswami, 1996; Deshpande and Ojha, 1993; Suthar and Das, 1996; Oloso and Clarke, 1993; Hsu *et al.*, 1991; Carman, 1996; Aviara *et al.*, 1999; Chandrasekar and Viswanathan, 1999; Ogut, 1998; Viswanathan *et al.*, 1996). Jain and Bal (1997) have studied some physical properties and oil content of P.typhoides variety of pearl millet. Till date no literature is found on physical properties of finger millet.

Theoretical considerations:

According to Mohsenin (1970), the degree of sphericity, ϕ can be expressed as follows:

$$\phi = \frac{(LWT)^{1/3}}{L} \quad (1)$$

where L is the grain length, W the grain width and T is the grain thickness.