

## Engineering properties of raw banana (*Musa paradisiaca* L.) fruit

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**SUMMARY :** This study was to undertaken to investigate some basic engineering properties of two raw banana fruit cultivar in order to facilitate the design of banana processing machineries. These properties are also important for designing of handling and storage equipments for banana processing industries. These engineering properties were investigated at an average pulp and peel moisture content 219.27 per cent (db) and 907.27 per cent (db), respectively were for Musa Cavendish and 287.86 per cent (db) and 897.34 per cent (db), respectively for Robusta. The weight 93.74 g and 149.19 g, effective length 13.24 cm and 17.32 cm, bulk density 940.09 kg/m<sup>3</sup> and 988.36 kg/m<sup>3</sup> and pulp to peel ratio 1.53 and 1.57, respectively for Musa Cavendish and Robusta. The banana diameter and peel thickness depend upon the variety, maturity and portion of it, *i.e.* top to bottom. Diameter at top, middle and bottom for cultivar Musa Cavendish was 31.66 mm, 34.47 mm and 31.65 mm and for Robusta cultivar it was 32.69 mm, 34.62 mm and 32.18 mm. Thickness of peel was found less in Musa Cavendish cultivar (4.45 mm) than Robusta (4.55 mm). The average load required to puncture banana using 2 mm diameter cylindrical probe with peel and without peel was 7.043 N and 5.355 N, respectively for Musa Cavendish, and 7.719 N and 5.277 N for Robusta and it was found 34.621 N and 19.334 N for Musa Cavendish and 48.08 N and 20.456 N for Robusta by using 5 mm diameter cylindrical probe.

**KEY WORDS :** Banana, Engineering properties, Cultivar

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**M**usa paradisiaca which is commonly called banana is herbaceous plant of the family *Musaceae*. It is originated from tropical region of south East Asia. Banana fruit is grown in more than 120 countries, mainly in sub-tropical areas. Banana is the most important fruit crop in terms of nutritive value, which has large scale demand for table purpose and is available in large quantity throughout the year.

Banana is the second largest produced fruit after citrus, contributing about 16 per cent of the world's total fruit production (FAO, 2009). India is largest producer of banana, contributing to 27 per cent of world's production. The major banana producing states are Maharashtra, Kerala, Tamilnadu, Gujarat, Bihar, West Bengal, Assam, Andhra Pradesh and

Karnataka (Mohapatra *et al.*, 2010). According to Indian horticulture database banana cultivation area and production in India was 830 ha, 29,780 MT, respectively in 2010-11 (Kumar *et al.*, 2011). Banana is a fast growing and high biomass-yielding plant. There are approximately 1200 seedless fleshy fruit varieties. They are cultivated primarily for their fruit and to a lesser extent to make fiber and as ornamental plants. The fruit stalk, or bunch, is the organ of interest for banana cultivation, primarily for food purposes. A period of about 8-13 months exists between planting the banana tree and harvesting bunches, which can contain 100-400 fruit. Optimum harvest date, or flowering-harvest interval, is determined from flowering, according to the climate zone and variety (Aurore *et al.* (2009).

Bananas are in the shape of a long curving cylinder. The bottom end narrows to a point and the top end has a thick stem that attaches the fruit to the inflorescence stalk. A small group of bananas is termed "hands". Hands are collectively known as "bunches". Banana skin is smooth and thick and often has a few vertical ridges that run the length of the fruit. The flesh is creamy white and soft. Bananas are usually yellow (green when unripe), but there are also red and brown cultivars. Bananas are harvested in the unripe stage when the fruits are still green

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