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Development of mango stone decorticator

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ABSTRACT : A mango stone decorticator was developed and evaluated for its performance. The developed decorticator consisted of main frame, feeding chute, cylinder assembly, concave, kernel and shell outlets, blower and a drive unit. The decorticator was tested for its performance by varying cylinder speed (200, 250 and 300 rpm), feed rate (150, 200 and 250 kg/h) and moisture content (10, 15 and 18% d.b.). The optimum operation conditions were found to be 250 rpm, 200 kg/h and 10 per cent moisture content. At this combination, the machine was found to have decortication efficiency and kernel breakage of 93.91 and 68.12 per cent, respectively.

KEY WORDS : Mango stone decorticator, Evaluation, Speed, Decortication efficiency, Breakage

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Mango (*Mangifera indica* L.) is one of the important fruit crops grown in India. It belongs to the family Anacardiaceae. India is the largest mango producing country in the world accounting for the production of 12.7 million MT (52% of total world production) during the year 2008-09. Mango fruit, either raw or ripe is greatly valued for its pulp, juice, flavour and taste. After consumption or industrial processing of the fruits, considerable amounts of mango seeds, generally known as stone are discarded as waste.

The mango stone is composed of outer hard and fibrous pericarp, and soft and nutritive inner kernel. According to mango varieties, the seed represents about 10 to 25 per cent of the whole fruit weight. The kernel inside the seed represents about 45 to 75 per cent of the seed and about 20 per cent of the whole fruit (Mirghani *et al*., 2009).

Since there is no exclusive market for the mango stones, they are accumulated and decomposed in the mango processing industries resulting in environmental pollution. These mango stones accumulated at food-processing industry sites can be processed to a product of utility. Decortication of mango stones is the important technological step in utilizing this waste material. Because of the size, shape and tough shell wall, the manual decorticating process is difficult, tedious, time consuming and labour intensive and also high volume of stones available at the factory sites justifies the need of a mechanical device to separate the outer pericarp from the inner kernel. Therefore, objective of this study is to develop a pilot scale mechanical mango stone decorticating machine and test its performance.

METHODOLOGY

Description of the machine:

The mango stone decorticator consists of main frame, feeding chute, cylinder assembly, concave, kernel and shell outlets, blower and a drive unit.

The main frame was fabricated using mild steel angle iron (50x50x6 mm) and well structured and braced to provide rigidity. The feeding chute of trapezoidal shape was mounted on decorticating section at an inclination of 40°. A hallow mild steel cylinder was co-axially fastened at the centre of the solid shaft by using two mild steel circular plates. Along the 15 per cent of the total cylinder length, mild steel flat was fastened in vertical position with a pitch of 102 mm, for positive feeding of mango stone inside the decortication section. Mild steel pegs of 12 mm diameter and 58 mm length were welded on to the cylinder along its length in four equally distributed rows with 17 pegs in each row. Centre to centre distance between adjacent pegs was 50 mm. Pegs of same size were fixed on one side of the top of the frame, such that the pegs on rotating cylinder would pass in between these stationary pegs during rotation. Main shaft was fixed on the top of the frame by means of pillow block bearings. Schematic diagram of cylinder assembly is shown in Fig. A. A cylinder housing was provided over the entire length of main frame top to enclose decortication section. Two semi circular mild steel plates