

Research Paper :

## Performance testing of stirrer type fruit washer

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### ABSTRACT

A prototype of mechanical fruit washer was developed and evaluated for its performance. The effect of three different rotor speeds (1466, 1476 and 1486 rpm) and types (A,B,C) with 20 cm (110 lit) depth of water on capacity and performance index was evaluated. Mango, potato and tomato fruits were used for evaluation of washers. The higher washing efficiency (98.09%) was observed for rotor C at 1486 rpm for tomato washing. Highest capacity (833.17 kg/hr) was found with 98.09% washing efficiency at 1486 rpm for rotor C in case of tomato washing. Performance index at maximum efficiency (98.09%) found was 3.90. The cost of manual to mechanical washing for mango, potato and tomato was 4.26:1, 5.89:1 and 7.58:1, respectively. The average cost of mechanical washing was Rs.24.80 per tonne. The cost machine was Rs.14,650/- including electric motor. The overall dimensions of machine were 1000 x 560 x 750 mm.

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There are attractive opportunities for entrepreneurs in the field of fruit and vegetables processing. The installed capacity of fruit and vegetable processing industries has increased from 21 lakh tonnes in 1979 to 22 lakh tonnes in 2000. The production of processed fruits and vegetables in the country has increased from 9.8 lakh tonnes in 1999 to 9.9 lakh tonnes in 2000 (Rasul, 2002).

Fruits processing industry has been termed as a "sun rise industry" and several efforts have been made in last few years to give a big thrust to this sector. With liberalization of the economy in 1991 and globalization, it was felt that fruit processing industry would come of in a big way. India ranks second in the world production of fruits with an annual production of 45.49 million tonnes. The areas under fruit production has increased from a meagre 1.22 million hectare in 1961 to 3.79 million hectare in 2000-01 accounting for an increase of 1.72% productivity per hectare has nearly doubled from the level of 5.52 to 10.28 t/ha. Presently the areas under fruits and vegetables production are 5.63 and 5.6 million hectares, respectively (Raganna, 2003).

Washing of fruits and vegetables is vital steps in any processing operation, which give attractive and chemical free fruits. At present washing of fruits is carried out manually which very tedious and time consuming. In view of this a prototype of mechanical fruit washer (stirrer type) was developed at Dr. A.S. College of Agricultural Engg. and Technology, Mahatma Phule Krishi Vidyapeeth, Rahuri (Maharashtra). The fruit washer was tested to mango, potato and tomato washing.

### METHODOLOGY

The machine works on the principle of turbulent flow of water created by different rotors in the machine chamber. The fruits kept in washing tray would come in contact with the vortex created by water in the chamber and fruit get washed. The turbulence of water is available from the sides and bottom of tray, which effectively wash the fruit without any mechanical damage.

The fruit washing machine (stirrer type) (Fig.1) consisted mainly;

- Washing unit
- Body and lid
- Rotor assembly (Fig. 2)
- Main frame
- Power transmission unit and drive mechanism

#### Washing unit:

Washing unit consisted of washing tray. The tray was fabricated by using M.S. angle and iron netting, rectangular in shape. The overall dimension of tray was 280 x 370 x 550 mm. The tray was painted with special enamel paint to avoid rusting from water. The tray was fitted in the chamber by supporting frame at distance of 150 mm from the bottom. The tray was fitted exactly at the centre of chamber by keeping equal distance (100 mm) from all the four sides.

#### Body and lid:

The body of the washer was fabricated with 20 gauge G.I. sheet (1.2 mm). The overall body dimensions were 850 x 560 x 650 mm. The machine was covered