

Research Paper :

Design and development of sapota fruit grader

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Accepted : December, 2009

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ABSTRACT

Grading is a vital as well as pre requisite step in marketing and processing of fruits. The normal practice in India is to grade manually on size basis. One person grades 200 kg of fruits in a day. In order to increase the output of fruit grading and save time and labour, a sapota fruit grader based on divergent roller type principle was designed and developed. The best combination of roller speed, its inclination and roller gap was found to be 223 rpm, 4.5° and 38 to 64 mm, respectively for highest efficiency of 89.5%. The capacity of machine was 1440 kg/hr and costed Rs.11,450/- (without electric motor).

Key words : Sapota fruits, Grader, Performance, Efficiency, Design and development, Fruit grader

Sapota is grown in almost all the Southern states of India. The area under this crop in India is estimated to be 64,400 ha with annual production of 8,03,000 tonnes. The average productivity of India is 12.46 t/ha. In Maharashtra, the area under this crop is nearly 14,897 ha with a production of about 1,57,430 tonnes. The average productivity of sapota in Maharashtra is 10.57 t/ha (Singhal, 1999). In market, grading provides basis for pricing, buying and selling. Grading is thus a vital as well as pre-requisite step in processing of fruits. Roller grading is fast, accurate and causes little damage to the fruits and is extensively used in fruit industries. According to fruit market survey, size of the fruits plays most important role in fetching remunerative market price. Manually assisted mechanical grading will be the probable solution to overcome time consuming, labour intensive and cost problems and it will help satisfy the farmer's need at low cost. Grading of fruits into various size and shape categories is usually one of the first and important steps in processing operation. Grading of fruits is a very crucial operation as it determines the price, fetched to the growers. The fruits are graded for size and quality. Grading and standardization brings about an overall improvement not only in the marketing system but also in raising quality consciousness. The normal practice in India is to grade manually. There are many principles being used in grading machines. Different types of graders have been developed for different fruits and vegetables such as mechanical grader, electronic size and colour grader, divergent belts, perforated belts, divergent rollers, weight cups etc. In view of this a sapota fruit grader based on divergent roller

principle was designed and developed.

METHODOLOGY

A divergent roller type Sapota fruit grader was designed and developed in the department of Agricultural Process Engineering, Mahatma Phule Krishi Vidyapeeth, Rahuri (M.S.). The basic structure of machine consisted of four units viz., grading unit, feeding unit, collection unit and power transmission unit (Fig. 1)

Grading unit:

Grading unit consisted of main frame, grading rollers and guiding channels (Fig. 2). The main frame of the grading unit was fabricated in rectangular shape with an overall dimension of 1220 mm X 1000 mm X 560 mm on which all the accessories are mounted. The frame is made up of 30 mm M. S. angles. Mild steel pipe (OD = 30 mm and ID = 26 mm) was used as grading rollers. The overall length of grading rollers was 1400 mm. Two pairs of the rollers were mounted side by side on the grading frame exactly below the feeding unit. The rollers were mounted on the main frame with the help of slotted type M. S. flat at the feed end and rear end. The rollers were rotated by using sprocket and chain arrangement provided at the feed end while rear end was attached on revolving bearing pedestal. The sprockets were connected to the power transmission unit while the other end (rear end) was movable. The progressive increasing gap between the rollers was achieved by sliding the rear end as well as feed end of the rollers as per requirement. The precision was provided at the rear end to increase the gap upto