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Original Research Article

A review: Design and development of guava fruit pulper

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Abstract

This review paper is based on the design, development and fabrication of fruit juice extracting equipment. To achieve pulp extraction, force is needed and the force depends on the biological nature and structure of the fruit from which pulp is to be extracted. The overall extraction is to achieve by means of small sharpened blades on a shaft which rotates against the stationary sieve with the electrical motor. Guava belongs to the family Myrtaceae is a traditionally used plant because of its nutritional. It is widely grown in tropical and rich in vitamin C. Guava fruit are source antioxidant dietary fibre. It is a commonly used fruit in our day to day life. It has always been a problem to successfully and completely remove Seeds. This review paper is aim by carrying out the performance evaluation of different equipment's such as manually operated and power operated which will help to minimize time consume, working fatigue and to reduce labour cost for pulp extraction of guava.

Key Words: Extraction, Pulp, Processing, Guava, Seeds.

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INTRODUCTION

Extraction is a process by which substance are removed for their original component or raw state. Hence, Extraction of juice (juice extraction) may be defined as the removal of juice from fruits; the juice is separated from the skin or chaff. To achieve juice extraction, force is needed and the force depends on the biological nature and structure of the fruit from which the juice is to be extracted. In the design and fabrication of the fruit juice extracting machine careful selection of the most suitable materials are major concerns. The skills knowledge and understanding the importance of hygiene is also a valuable factor [1]. Purpose of the study is to design a Guava fruit pulper processing machine for the benefit of the local farmers, the goal being to enhance food security and income generation through Guava Fruit pulp products and new tastes. Guava belonging to family Myrtaceae is a traditionally used plant because of its nutritional and food value. Guava is widely grown in tropical and many areas like India, Bangladesh, Florida and West Indies. Guava is a small tropical tree that grows up to 35 feet tall having immense medicinal important. Guava is 5 times richer in Vitamin C than oranges. Phosphoric Oxalic, Malic acid and Manganese are also present this fruit. Ascorbic acid mainly found in fruit skin varies from 56 -600 mg and may range to 350–450 mg in nearly ripen fruit. Canning and other heat processing destroy about 50% of ascorbic acid. The strong odour of fruit is attributed to carbonyl compound[2]. Guava has gained considerable importance because of its commercial and high nutritive value, availability at moderate price, a pleasant aroma, good flavor, delicious taste and remunerative nature of crops. Guava fruit is an excellent source of ascorbic acid (vitamin C), dietary fiber, pectin and good source of vitamin A, phosphorus, calcium and iron as well as thiamine, niacin, riboflavin and carotene[3]. India leads the world in guava production with annual production of 1.80 MT with the production area of 0.15 Mha. It is the fourth most widely grown fruit crop in India. The popular varieties of guava grown in India are Allahabad Safeda, Lucknoe-49, Baraipur, Nagpur Seedless, Dharwar etc[4]. Guava fruit is normally consumed as fresh as a dessert fruit or in processed form as puree, juice, concentrate, jam, jelly, cheese, toffee, fruit flakes, squash, syrup, nectar, powder, wine, vinegar, ready to use snacks, drinks and dehydrated canned products[5]. Guava fruit comes in

two varieties with white and pink interior Interspersed with small hard seeds. White guava is sweeter in taste and grown on a larger scale while the pink guava is considered as a delicacy. Guava Pulp is prepared by extracting the pulp obtained from mature Guava. Fully matured and ripened Guava are harvested, quickly transported to fruit processing plant, inspected and washed. Selected high quality fruits go to the extracting section.

MATERIAL AND METHODS

Various types of materials and parts of pulper used for pulping are as follows. The materials used were selected based on their availability, cost, suitability and viability in service among other considerations. In designing of the pulper machine some properties of Guava are required such as physical properties (shape, size, sphericity, surface area and weight of the Guava), mechanical properties (compressive strength of guava when placed on horizontal screw positions)

1. **Stainless steel** for the blades, shafts, extraction chamber, sieves.
2. **Iron metal** for stand or frame and electrical motor.
3. **Fabricator** for the hopper, juice collector, waste collector.

- **Feed Hopper:** This is where the fruits are being put into the machine, the feed hopper is made of fabricator.
- **Slicing Blades:** The slicing blade is made of stainless steel and is used to cut the fruit into smaller portion before going to the helical screw.
- **Conveyor Shaft:** It is a solid circular and made of stainless steel that carries the blade that do the cutting through the rotation of the shaft by transmission of power from the electric motor through the help of gears.
- **Juice Collector:** The juice collector is made of transparent fabricator and is used to collect juice from the sieves chamber and it is located under the cylindrical chamber.
- **Waste Collector:** The waste collector is made of transparent fabricator and is used to collect waste from the sieves chamber and it is located side of the cylindrical chamber.
- **Sieves:** Sieves are made up of stainless steel for the separation of solid waste and pulp.
- **Electric Motor:** The motor supplies power to the gear which transmit power to the rotating shaft.
- **Outer Cylinderical chamber:** It is constructed with stainless steel and contains Blade and the shaft that carries the extracting.
- **Main frame:** The frame is made of mildsteel. It supports and carries the weight of the machine and its components.

The operating principle is to convey the fruits by helical screw against a stationary sieve, due to frictional and shear forces the fruit pulp will be separated from the seed. The results of the project will be based on the prototype output and efficiency of the concept. The merits of using machine for extraction are: time saving, improved efficiency, increase capacity and reduction in spoilage and waste.

LITERATURE REVIEW

Kumar Study the therapeutic effect of psidium guajava is studied by using these information. The plants for thousands of years have been used to enhance health and for medicinal purposes. *Psidium guajava* is one of which has an enormous wealth of medicinal value. It for long has been known for its anti-inflammatory, antimicrobial, anti-oxidant, antidiarrheal, antimutagenic properties. Hence this review is an attempt to highlight the potential of p. guajava in the treatment of periodontal disease[2]. Sylvester design and constructed the orange juice extractor has been using scientific and engineering principles. The machine has a diameter of 160 mm and a height of 350 mm. The juice extraction is achieved by means of small sharpened blades on a shaft which rotates with the aid of the bevel drive. The rotation is achieved by turning the handle. This project has made it possible to extract juice from orange fruits easily and faster. The machine is of a unique type and is readily available to those that are interested at an affordable price[6]. Gbasouzor, *et. al.*, They do the research work has successfully presented a functional and highly efficient low cost fruit juice extracting machine by minimizing local technique of squeezing and sucking of fruits, hence improving the hygienic and health condition of individuals also design for home and industrial usage. The machine is versatility, durability, and the capacity were the main area of concentration. Though after the design and fabrication of the machine, some lapse were notice the machine could not remove all fruits sediments after extraction and requires further filtration. Some of its components were manufactured locally, it can be easily fabricated, reproduced and maintained without fear of spare part during maintenance[1]. Gomathi, *et. al*. They Design the machine is theoretically calculated, with the reference of these calculated values the further implementation and fabrication of the machine is done. but at the same time it is very flexible because a slight modification can be made for the efficient function of the system. Thus a new system for pomegranate deseeding is developed. The complete automation of the system is

achieved and the system proves to be cost effective as well[7]. Bundit *et. al,* They constructed of a prototype automatic young coconut fruit trimming machine. The fruit consists of a husk enclosing shell, flesh and juice. Normally, the fruit is manually trimmed requires considerable physical strength and a very large sharp knife, and thus is a dangerous procedure. Other problems associated with manual trimming are the shortage of skilled labour and the considerable amount of time that the trimming procedure takes[8]. Olabisi, O.I. and Adelegan, G.O. They design and construct a device that can extract juice from citrus fruits easily and faster. The total cost of producing the machine with and without electric motor are 102,500 and 82,600 respectively. The mass production of this locally produced juice extractor will further reduce its cost and therefore make it relatively cheaper, affordable and available to both small and medium scale food industries to purchase compared to the imported ones. This will no doubt enhance the economic development of our country[9].

RESULTS

Table 1: Chemical composition of Guava Fruit:- Source (Kamanth *et al*, 2008)[10].

Constituent	Availability (as per 100 gm)
Calories	77 - 86 gm
Moisture	2.8 – 5.5 gm
Crude fibre	0.9 – 1.0 gm
Protein	0.1 – 0.5 gm
Fat	0.43-0.7 gm
Ash	9.5 – 10 %
Carbohydrates	9.1 – 17 gm
Calcium	17.8 – 30 mg
Phosphorous	0.30 – 0.70 mg
Iron	200-400 I.U
Vitamin C	228 mg

CONCLUSION

The main aim of this review paper is to have a proper understanding of different aspects or constraints of equipment as well as different pulping techniques to reduce the efforts which were put in by farmers in terms of money, labour, time, physical efforts for economical growth. Design consideration of equipment also has a greater impact over the performance of pulper. Also the objective of this equipment is satisfied with the designs that have been developed from the available local materials. The overall extraction is achieved by means of small sharpened blades on a shaft which rotates against the stationary sieve with the electrical motor. The fruit extraction technology, it is possible and very sustainable to extract fruit pulp for small-scale fruit pulp production under both urban and rural conditions. By selecting this project we could understand, become familiar and know the details of agricultural technology, with the help of this semi-automatic machine we are trying to reduce labour cost, time of a middle class and small sector farmers. This is our little effort to make comfort to our farmers who feed our country.

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