

DEVELOPMENT AND EVALUATION OF A HAND OPERATED FRUIT JUICE EXTRACTOR

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ABSTRACT

A hand operated jack fruit juice extrator was developed. It was fabricated with a metallic cylindrical container perforated at the bottom with 2.38 mm size holes. The hole to hole distance was maintained to 3.18 mm. A round plate was made and attached to a handle to move up and down inside the container. Four fruits and vegetable such as pineapple, tomato, lemon, and jack fruit were chosen for performance test of the extractor. The juice yields (%) for pineapple, tomato, lemon and jackfruit were found 58%, 52.8%, 22.8% and 45%, respectively. The cost of fabrication of the extractor was Tk. 150 only. The device may be very useful for extraction of juice of other similar fruits and vegetables.

INTRODUCTION

Bangladesh produces numerous fruits and vegetables. The Table 1 shows the annual production and consumption to jackfruit, pineapple, tomato and citrus fruit in Bangladesh (BBS, 1984). The jackfruit sold annually are about the worth of Tk. 100 millions. But most of their juice is not being processed for the whole year. For this reason, farmers are not receiving appropriate value for this fruit. A simple juice extracting device with low manufacturing cost is vitally important for this country. In Bangladesh very limited work on juice extractor has been performed in the past. Variuos traditional equipment are used to crush many agricultural and non agricultural products. Singh and Pandey (1991) conducted an experiment on grinding characteristics of coriander and found that the energy consumption decreases with the increasing feed rate. Strasser (1990) conducted on experiment on roller crusher and found that the roller crusher offers great potential for energy savings as well as the production increases.

Table 1 Fruits and Vegetable Production and Consumption in Bangladesh

Fruits/ vegetables	Annual production (ton)	Per capita consumption (kg)
Jackfruit	2,39,000	2.1
Pineapple	1,41,000	1.3
Tomato	83,000	0.7
Citrus fruit	8,000	-

People of Bangladesh extract fruit juice traditionally by hand. But extracting fruit juice by hand is very inconvenient. Extraction of this juice in a convenient method at a very low operating cost is essential. Like other fruit juice and vegetable, jack fruit juice may also be preserved, but it had not been possible due to lack of suitable extraction devices.

There are few electrical devices to extract fruit juice. Their use is very limited to the people of city areas. The majority of population of this country live in rural areas and their economic status is low. Although, they extract juice from various fruits and vegetable by traditional means, it is the well known

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fact that they can not use any electrical machineries for extract those due to high purchase and operating costs. Not only the villagers, but also most of the urban people are unable to purchase electrical machineries for juice extraction. Hence, an attempt has been made to develop a hand operated fruit juice extractor. The objectives of the work were;

1. To develop a low cost hand operated fruit juice extractor, especially suitable for jackfruit,
2. To determine the capacity of the extractor.

MATERIALS AND METHODS

A 13 mm diameter metallic container without top was taken and its bottom was drilled with uniform spacing. A ring of mild steel bar was made to hold the neck of the container. A handle was made by angle bar and joined with a ring (Fig. 1). A clip was joined at the opposite side of the ring. Another handle was made and connected to the clip with a pivot, so that it can move in upward and downward directions while pressing. A round plate was made with G.I. sheet and connected to the upper handle with two converging rods. Fig. 2 shows the fabricated fruit juice extractor.

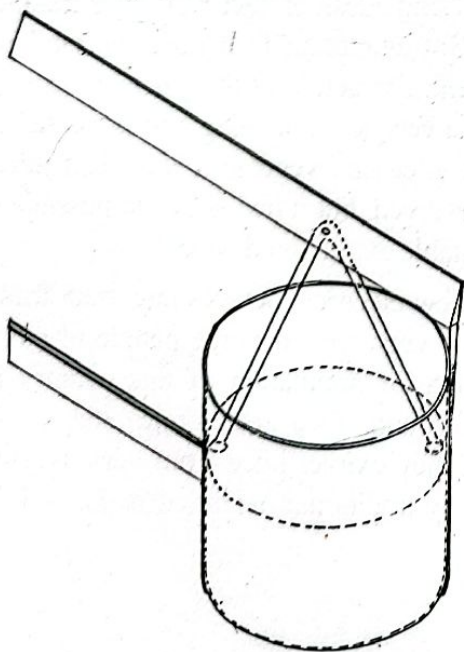


Fig. 1: ISOMETRIC VIEW OF HAND OPERATED JACK FRUIT JUICE-EXTRACTOR

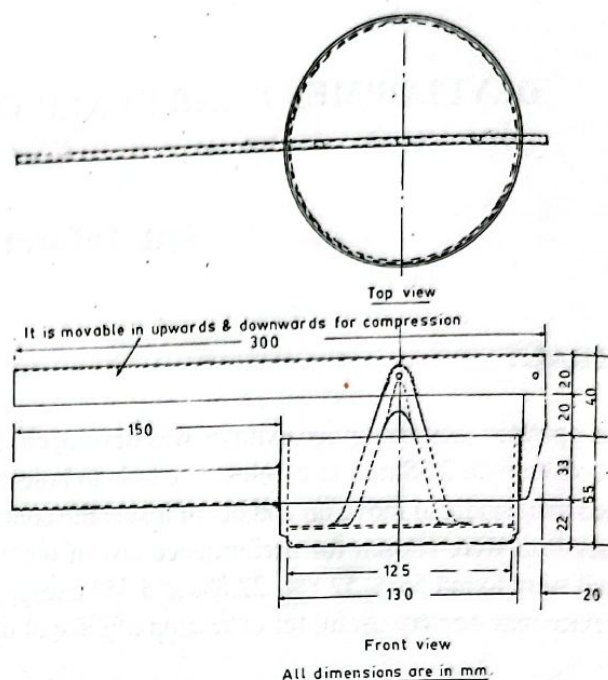


Fig. 2: TOP VIEW AND FRONT VIEW OF HAND OPERATED JACK-FRUIT JUICE EXTRACTOR.

The overall dimensions of the device was as follows;

Inside diameter of the container = 13 mm

Diameter of the pressure plate = 12.5 mm

Height of the container = 55 mm

Diameter of the holes at the bottom of the container = 2.38 mm

Hole to hole distance = 3.18 mm

Length of the upper handle = 300 mm

Length of the lower handle = 150 mm

Height between the upper handle and plate = 40 mm

Evaluation Procedure for the Juice Extractor:

For jack fruit juice, seeds and other inedible things were removed. Then, those were kept in the container and pressed. For pineapple juice, pineapple was peeled and sliced into several pieces with a knife. The hard core of the pineapple was removed. It was kept in the container and pressed. For lemon juice, lemon was peeled and cut into several pieces. Then, it was kept in the container and pressed. For tomato juice, tomato was cut into several pieces. It was also kept in the container and pressed.

For all of the above tests hand pressures were measured by a spring balance connecting with the handle of the extractor during pressing. Time was

measured by a stop watch. Weights of the pulp and juice extracted were weighed by a weighing balance.

The following formula was used for determination of juice yield;

$$\text{Juice yield (\%)} = \frac{\text{weight of juice extracted}}{\text{weight of pulp}} \times 100$$

Formula used for determination of the capacity of the extractor was;

$$\text{Capacity} = \frac{\text{weight of juice extracted}}{\text{time required}}$$

RESULTS

The extractor was tested for jackfruit, pineapple, lemon, and tomato juice. Juice yield (%), time required, capacity, and hand pressure applied were determined and measured and the results were given in Table 2. The juice yields for pineapple, tomato, lemon and jack fruit were found 56%, 52.8%, 22.8% and 45%, respectively. The results indicated that the device is suitable to extract juice for pineapple, tomato and jackfruit. The performance of the device seems to be not suitable for extracting of lemon juice. The cost of fabrication of the device was Tk. 150 only.

Table 2 Juice yield and the capacity of the extractor for fruits and vegetable

Fruit/vegetable	Weight of pulp (gm)	Weight of juice extracted (gm)	Juice yield (%)	Time reqd. (sec)	Hand pressure applied (kgf)	Capacity of the extractor (kg/hr)
Jackfruit	200	90.0	45.0	235	15	1.13
Pineapple	300	174.0	58.0	270	15	2.32
Lemon	100	22.8	22.8	280	15	0.30
Tomato	200	105.6	52.8	264	15	1.43

CONCLUSION

Four fruits and vegetable such as pineapple, tomato, lemon, and jackfruit were chosen for performance test of the extractor. The juice yields (%) for pineapple, tomato, lemon and jack fruit were found to be 56%, 52.8%, 22.8% and 45%, respectively. The cost of fabrication of the extractor was Tk. 150 only. The device may be very useful for extraction of juice of pineapple, lemon and jackfruit.

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