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Development of manually operated papad cutter for small scale papad making units

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ABSTRACT

Papad is a popular and tasty food item in the Indian diet since many centuries. Traditionally this activity was confined to household papad making but in view of increasing demand and availability of machinery (mechanization) it has now been developed in cottage and small scale sector. Manufacturing of Papad is one of the traditional activities in the rural area in the Country. Papad is one of the very popular and delicious eatable item. The product is having very good market demand in the Country and also in abroad. In case of mechanization, a papad cutter at AICRP on PHT, Dr. PDKV, Akola was developed in year 2014. This papad cutter cuts semidried *sorgo papads* in to small size square shape (25 × 25 mm), other than square different shapes of *sorgo papads* observed during testing are Viz. rhombus, triangular, etc. Hence, Square shape cut pieces of *Sorgo papads* were easy for packing (in bulk), handling and transportation. The performance of papad cutter was tested on sorgo papad (*Sandoli* and *Bibadi*). The developed Papad cutter was having 6.23 kg/h and 2.65 kg/h capacity and 97% and 94% cutting efficiency for *Sandoli* and *Bibadi*, respectively.

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Papad is a popular and tasty food item in the Indian diet since many centuries. It is essentially a wafer-like product, round in shape and made from dough of powdered pulses, spices, powdered chilly and salt. Variety of pulses and proportion of pulses and spices varies from region to region depending upon preferences of local people whereas certain varieties are popular on a larger scale. Traditionally this activity was confined to household papad making but in view of increasing demand and availability of machinery (mechanisation) it has now been developed in cottage and small scale sector (Anonymous, 2014)

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The traditional products like Sorghum *papad* such as *Sandoli* (made by using fine sorghum flour) and *Bibadi* (made by using coarse sorghum flour) are very popular in Maharashtra and other part of India, however, preparation of these products is tedious and skill-specific. (Borkar et. al, 2014)

In case of mechanization, a papad cutter at AICRP on PHT, Dr. PDKV, Akola was developed in year 2014. This papad cutter cuts semidried papads in to small size square shape (25 × 25 mm), other than square different shapes of *sorgo papad* observed during testing are Viz. rhombus, triangular, etc. The performance of papad cutter was tested on sorgo papad (*Sandoli* and *Bibadi*) (Borkar et. al, 2014).

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The traditional circular uneven shape of the *Sandoli* and *Bibadi* was one of the hindrance in packaging the product, its transportation and storage space. Hence, *Sorgo papads* were cut in to square pieces which were easy for packing (in bulk), handling and transportation. Also the small size (25×25 mm) of *Sorgo papad are* convenient for consumption after roasting or frying (Borkar et. al 2014).

MATERIAL AND METHODS

Construction

A papad cutter was developed (Fig.1 & Plate 1) consisting of lower and upper assembly. The lower assembly consists of stand fitted with rectangular wooden plate above which circular wooden plate was provided which can be rotated with the help of ball bearing fitted in the centre of rectangular wooden plate. A lower assembly was having stand 380 mm (L), 370 mm (B) and 230 mm (H) fabricated by using m.s. angle 25×25×3 mm. A 25 mm thick rectangular wooden base plate (platform) (Teakwood) of size 350 mm × 355 mm was fitted on this stand. At the centre of this plate a ball bearing with housing was fitted. Above this, 280 mm diameter and 25 mm thick circular wooden plate (Teak wood) was fitted with the help of mounting which can rotate horizontally. Four fibre wheels were fitted on rectangular wooden base plate (platform) beneath rotating circular wooden plate so that circular wooden plate would not tilt by the pressure of rolling cutter having circular steel cutting blades for cutting *Sandoli /Bibadi* (*sorghum papad*). The upper assembly consists of rolling cutter, chain and sprocket arrangement to move rolling cutter and handle fitted in m.s. angle iron frame (upper).The rolling cutter was fabricated by fitting 11 nos. of 75 mm diameter, 1.25 mm thick circular cutting blades of stainless steel

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(Grade 304) having sharp cutting edge fitted on 20 mm diameter bright shaft. The spacing between each cutting blade was 25 mm in order to cut 25 mm × 25 mm pieces of *papad.* At both the ends of this shaft, ball bearings with housing were fitted besides, sprockets were also fitted which were rolling on chain (on both sides) 440 mm length. The chain was fitted in upper frame with the help of nut and bolt so that the tension of chain can be adjusted. At one end of shaft, handle was given so that the sprocket alongwith the rolling cutter can roll on the circular wooden plate in both forward and backward direction. This upper assembly was fitted in 390 mm × 440 mm frame fabricated by using 25 mm × 25 mm × 3 mm m.s. angle. This upper assembly (frame) was fitted to lower assembly (frame) by adjusting nut and bolt so that by tightening the nut, upper assembly (consisting of rolling cutter) comes closes to lower assembly (consisting of circular wooden plate) and requisite pressure of cutting roller can be exerted on papads kept on rotating circular wooden plate sufficient to cut it.

During initial testing, it was observed that cut strips of papads were sticking to cutting blades and coming up with blades. So ten nos. of 20 mm wide stainless steel plates (20 gauge) were fitted between each cutting blades with the help of m.s. square pipe 25 × 25 mm which was fitted with the cutting roll beneath it on both the sides with the help of m.s. plate 2 mm thick. These s.s. plates served as scraper in order to avoid sticking of papads to the blades. The fibre wheels were also given at both the ends of square pipe which were kept moving on the side angles so as to facilitate easy movement of scraper along with rolling cutter. A rectangular stainless steel outlet was provided to collect the product. A locking arrangement is also given to fix the desired angle of cutting by

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providing holes on the sides of rotating circular wooden plate with arrangement to lock it, so as to cut the *papads* in various shape viz. square, rhombus, triangular, etc.

Working

Initially the rolling cutter was moved to one side of circular wooden plate with the help of handle. Then 3-4 rolled circular *papads* can be placed on the rotating circular wooden plate. Requisite cutting pressure can be adjusted by tighting the nuts at four corners of stand. Then the rolling cutter can be moved on the *papads* by rotating handle manually. After completing one cut, the circular wooden plate can be rotated at desired position (considering shape of *papads* to be cut) and the handle is rotated in opposite direction so as to give second cut. Then the product (cut pieces of *papads*) can be collected in the container placed below outlet.

Plate 1 Papad cutter

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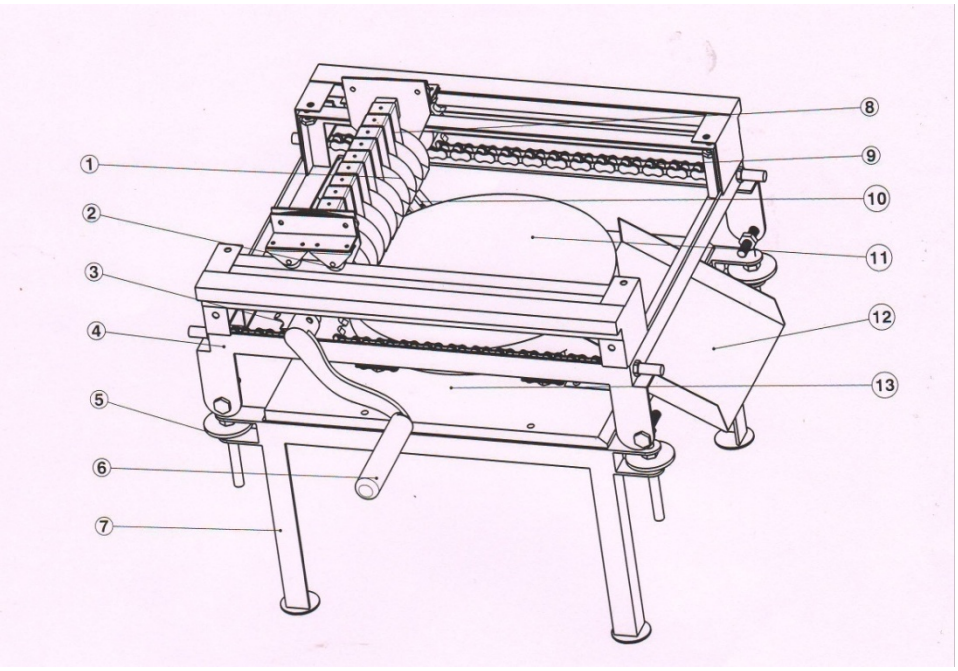

1. Circular cutting blade, 2. Fiber wheel, 3. SP Socket

4. Upper frame, 5. Check Nut, 6. Handle, 7. Stand,

8. Scraper, 9. Chain, 10. Locking Arrangement,

11. Circular wooden plate, 12. Outlet,

13. Rectangular wooden plate

Fig. 1 Papad cutter

***Papad* cutter testing**

Papad cutter was tested for cutting *sorgo papads* viz. *Sandoli* and *Bibadi*. The machine performance was evaluated with respect to capacity and cutting efficiency. The capacity of the machine was determined by cutting three *papads* at a time giving two cuts (perpendicular to each other by rotating circular wooden plate) so as to cut square size pieces of 25 mm size and weighing cut pieces irrespective of damage. The capacity of the machine is expressed as kg of cut pieces of *papad* per unit time. Breakage percentage is defined as the ratio of weight of damaged cut pieces to the total weight of cut pieces.

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Cutting efficiency is the inverse term of breaking percentage. The efficiency of the *papad* cutting machine was determined by the following expression (Balasubramaniam *et al*., 1993).

$$\alpha = \frac{W_T - W_D}{W_T}$$

Where,

α = Cutting efficiency, %

W_T = Weight of total cut pieces of *papad,* kg

W_D = Weight of damaged pieces of *papad,* kg

RESULTS AND DISCUSSION

Testing of *papad* cutter

The *papad* cutter was tested for cutting square pieces of *Sandoli* and *Bibadi*. The amount of semidried *Sandoli* & semidried *Bibadi* (Table 1) used for cutting was 2 kg each. Three *Sandolies* and *Bibadies* were used to cut at a time. It was observed that the theoretical capacity of *papad* cutter to cut square pieces of *Sandoli* was 10.38 kg. (Fig. 2). Considering 60 percent efficiency, the actual capacity comes to about 6.23 kg/h. The theoretical capacity of *papad* cutter to cut square pieces of *Bibadi* was 4.44 kg/h (Fig. 2). Considering 60 % efficiency, the actual capacity comes to about 2.65 kg/h. The low capacity in case of *Bibadi* can be attributed to time consumption in placing and cutting *Bibadi* due to its uneven shape and sticky nature during semidried condition. The square pieces obtained in case of *Sandoli* and *Bibadi* were 77.53 % and 70.47 % respectively (Fig. 4 & 5). The pieces other than square pieces were 19.51 % and 23.46 % in *Sandoli* and *Bibadi* respectively. This was because since circular shape *Sandoli* and *Bibadi* were cut into small square (25mm) pieces the end pieces were not square in shape. The damaged pieces

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were accounted to be 2.96 % and 6.17 % in *Sandoli* and *Bibadi* respectively. The cutting efficiency of *papad* cutter was 97 % for *Sandoli* and 94 % for *Bibadi* (Fig. 3)

Table 1 : Semidried condition of *sorgo papad* suitable for papad cutting

Sorgo papad	Moisture content, % (w.b.)	Hardness, Kg
Sandoli	31.64±0.42	0.4765±0.299
Bibadi	57.067±1.10	0.0474±0.017

(Source: Borkar et. al, 2014)

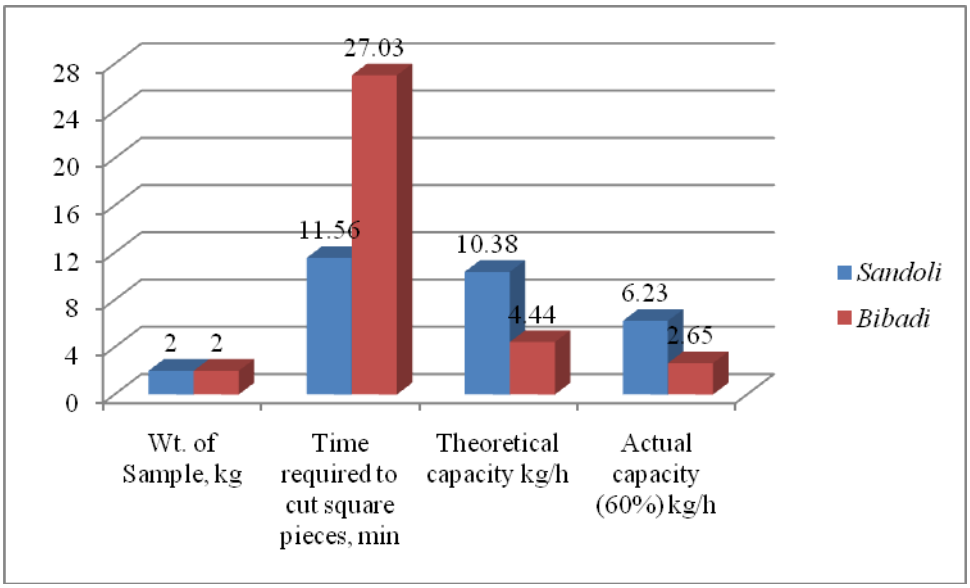

Fig.2 Capacity of papad cutter

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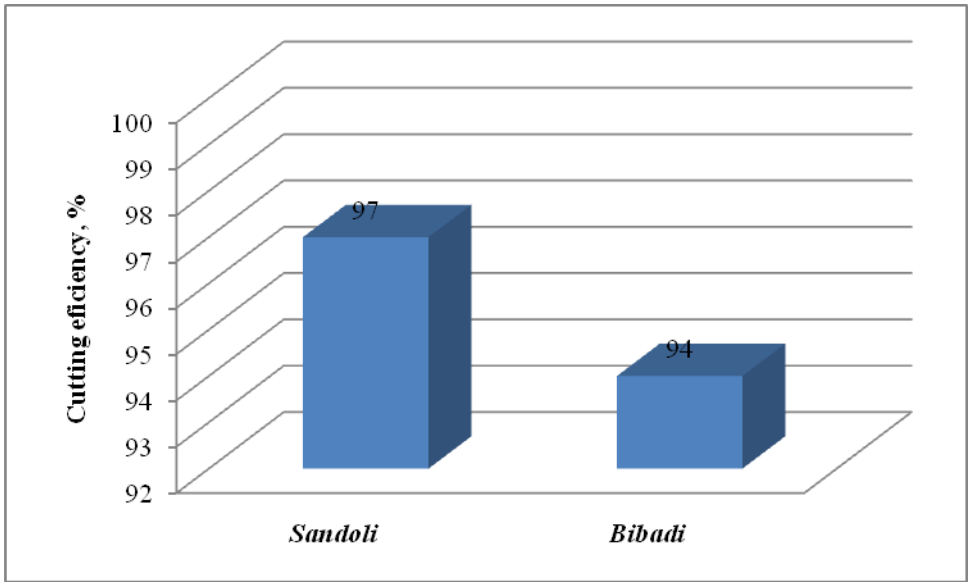

Fig. 3 Efficiency of papad cutter for *Sandoli* and *Bibadi*

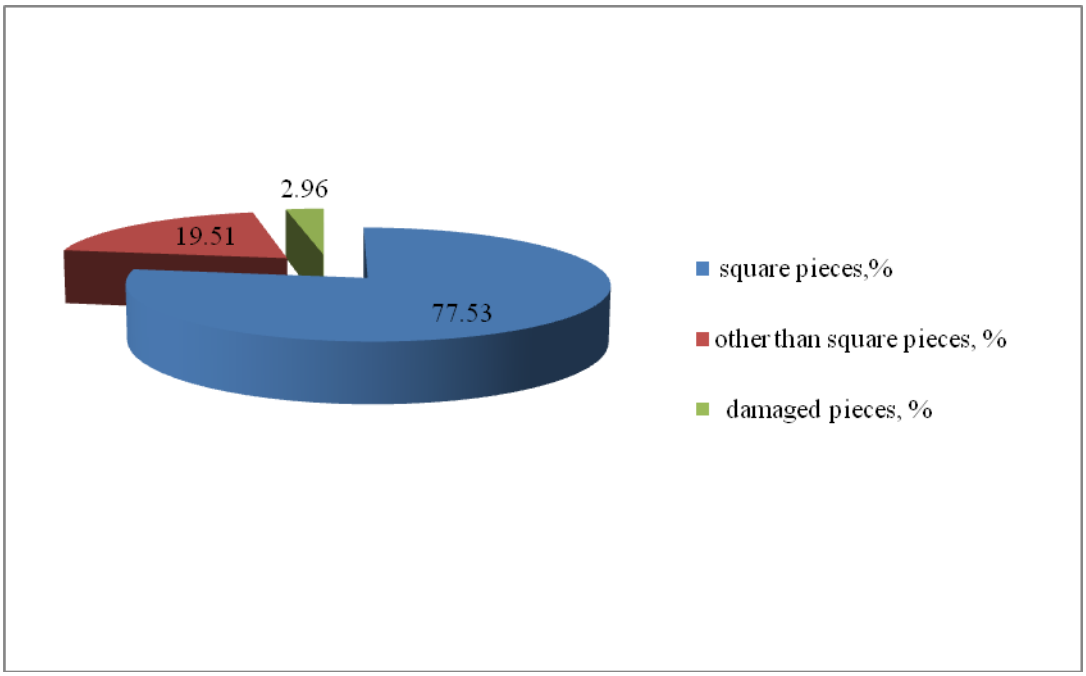

Fig. 4 Various fractions obtained during *Sandoli* cutting

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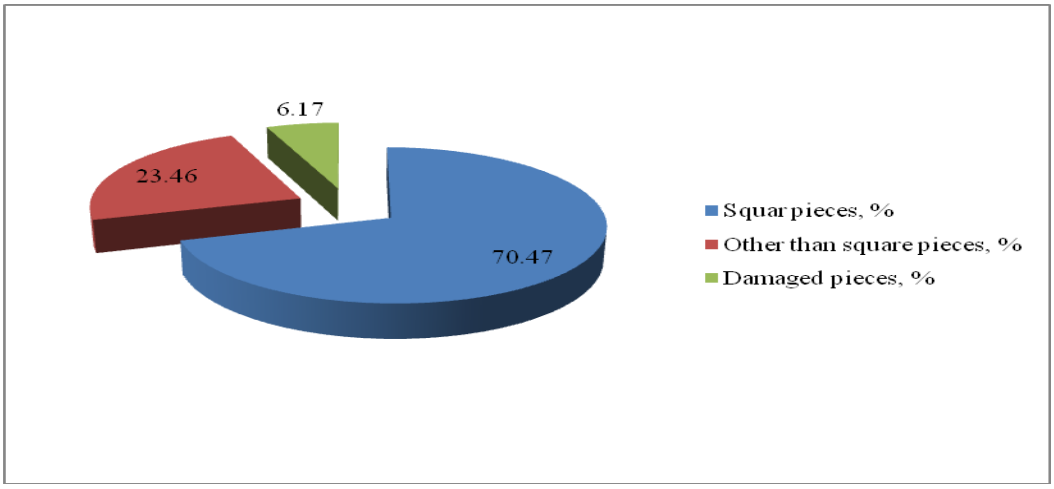

Fig. 5 Various fractions obtained during *Bibadi* cutting

CONCLUSIONS

Papad cutter was developed having 6.23 kg/h and 2.65 kg/h capacity and 97% and 94% cutting efficiency for *Sandoli* and *Bibadi*, respectively. The low capacity in case of *Bibadi* can be attributed to time consumption in placing and cutting *Bibadi* , due to its uneven shape and sticky nature during semidried condition.

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