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# Nutritional Quality on Value Addition to Jack Fruit Seed Flour

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***ABTRACTACT:*** ***study was undertaken with the objectives to estimate the physical and functional Properties proximate composition, nutritional quality, and utilization of jack seed flour in convenience food. The seeds were lye peeled, dried and milled into flour. The functional properties of the seed flour were analysed by standard AOAC method. The total yield of the flour was documented as 67.50 grams. The functional properties indicated that the jack seed flour had 104.30 ml/100 g of water absorption and 116.0 ml/10 g of oil absorption capacity the sensory quality of flour based biscuits decreased with increased incorporation level of seed flour. The overall acceptability of biscuits with jack seed flour below 30 was judged as very good. The 20 per cent seed flour incorporated biscuits were on par with control with respect to sensory qualities. The color of the biscuit indicated that, the control biscuits were significantly whiter than the rest***

**Keywords**: Jack fruit seeds, lye peeled, functional properties, and biscuits

## 1. Introduction

"The jacks…. Are such large and interesting fruits and trees so well behaved that it is difficult to explain the general lack of knowledge concerning them'. - O.W. Barret (1928)

### 1.1 Scientific classification

Kingdom: Plantae
Order: Rosales
Family: Moraceae
Tribe: Artocarpeae
Genus: *Artocarpus*
Jackfruit (*Artocarpusheterophyllus*Lam.) belongs to the family Moraceae, is a fairly large sized tree and bears the largest fruit among the edible fruits. Jackfruit tree is native to India and popular in several tropical and sub-tropical countries and the fruit is known as the 'poor man's fruit' in eastern and southern parts of India.

### 1.2 History

Jackfruit tree grows well not only under humid and warm climates of hill slopes, but also in arid plains of south India making it as one of the most suitable fruit crops for dry land horticulture. The total area under jack fruit cultivation is around 32,600 ha (Swamy, 2003) and jack tree is largely grown in southern states viz., Kerala, Tamil Nadu, Karnataka and Andhra Pradesh besides, in other states like Assam, Bihar, Orissa, Maharashtra and West Bengal. In Karnataka, jack fruit is grown on an area of 10,004 ha with a production of 2,42,296 tones per annum (Anon., 2001)

### 1.3 Anatomy

Jack fruit is largely propagated by seed and being a highly heterozygous and cross-pollinated crop, has resulted in immense variation in the population for yield, size, shape and quality of fruit and period of maturity. Cutting a jackfruit may seem quite a challenging task but once cut opened, the rest is easy and enjoyable. Jackfruit appears in the market in spring and continues until summer. The interior of ripe fruit consists of large, pleasant flavoured yellow sweet bulbs (fully developed perianths), massed among narrow ribbons of thin, though undeveloped perianths and a central pithy core constitute 25-30 per cent of the total fruit. Each bulb encloses a smooth, oval, light brown seed (endocarp) covered by a thin white membrane (exocarp). The seed is 2-4 cm long and 1.5 – 2.5 cm thick. There may be 100-120 or upto 500 seeds in a single fruit comprising 5-6 per cent of the total fruit. The pump (bulb) colour ranges from thin white, cream, yellow to bright orange. The size of the fruit lets ranges widely from small to big and thickness of pulp ranges from thin wafery to as thick as 0.5 cm while the sweetness ranges from slightly insipid to very sweet, the texture of the pulp ranges from soft to crispy. The pulp flavour ranges from very mildly scented to strongly scented and the size of the whole fruit ranges from 8 inches to 3 ft, as big as one weighing 20-50 kgs similarly the tree height also ranges from 50 to 60 ft.

### 1.4 Uses

The tender jack fruit is a popular vegetable and used in making soup and pickles. Chips and papads are also prepared from ripe and unripe pulp. The juicy pulp of the ripe fruit is eaten fresh or preserved in syrup and has wide potential for preparing jam, jelly due to the presence of pectin and used in the preparation of inumerous value added products. There is good market for these processed products in U.S., U.K. and gulf countries. The rind or skin of the fruit and leaves are excellent cattle feed. The yellow hard wood of the tree is valued timber for making of furniture's. Jackfruit trees are also grown for shade to betel, pepper and cardamom plantations. The seeds are generally eaten in boiled or roasted form or used in many culinary preparations, as it contains similar compositions as that of grains. As jack fruit is highly seasonal and seeds have shorter shelf life, hence go waste during the seasonal glut. So, the seed flour can be an alternative intermediatory product, which can be stored and utilized, both for value addition and to blend with other grain flours without affecting the functional and sensory profile of the final product.

Moreover, the incorporation of seed flour to deep fat fried products has found to reduce the fat absorption to a remarkable extent (Rajarajeshwari and Jamuna, 1999). The ripened fruit is a normally fibrous and composed of sugars like glucose, fructose, xylose, rhamnose, arabinose and galactose. The seeds are also rich source of carbohydrates and proteins and good source of fibre and B-complex vitamins. Chinese consider the jack fruit pulp and seeds useful in overcoming the effects of alcohol. In India too, the jack seed is an important ingredient in antidote preparation for heavy drinkers. The latex from the bark contains resin which is used sometimes to plug holes in earthern vats and in other products. The latex from the leaves has got capacity to kill bacteria. Jacalin, the major protein from the jack seeds has proved useful tool for the evaluation of immune status of patients infected with HIV (Morton, 1987). Being a good source of vitamin A, vitamin C and pectin, jackfruit also helps in alleviating the pancreatic ailments and aid in blood purification. With all these medicinal values and efficient ingredients in value added products the utilization of seed flour in convenience food has a long way to utilize the flour with value addition for marketability and to create employment among rural women for economic.

## 2. Objective

Objectives preparation of biscuit & bread by using jack fruit seed flour

1. To assess the nutritive value of the product.
2. To carry out the sensory evaluation to know the acceptance of the product

## 3. Material and Methodology

### 3.1 Preparation of seed flour

Procurement of seed material the jackfruit seeds were collected from the local market of kerela.

### 3.2Seed Treatment

The jackfruit seeds were cleaned manually and white arils (seed coat) were manually peeled off. Seeds were lye peeled, soaking in 3 per cent sodium hydroxide solution for 3-5 minutes to remove the thin brown by rubbing the seeds between the hands and washing thoroughly under running water.

**Plate 3.2:** seed after treatment

**Plate 4.2**: (i) Seed before treatment

### 3.3 Preparation of jackfruit seed flour

Lye peeled seeds were sliced into thin chips and dried at 50-60° C to a constant moisture. The dried chips were powdered in a flour mill, passed through 60mm mesh sieve and packed in polyethylene pouches and stored in a refrigerator (<10° C) for further analysis

**Plate 3.3:** Seed flour

### 3.4 Testing of Seed Flour

#### 3.4.1Functional qualities

Functional qualities such as water and oil absorption capacities, swelling power, percent solubility, flour dispersibility and viscosity of the seed flour were analysed.

#### 3.4.2Water absorption capacity

Twenty grams of seed flour was taken and required quantity of water added to get a dough of moderately stiff consistency. The amount of water required was noted and expressed in percent

#### 3.4.3 Fat absorption capacity

One gram of seed flour sample was taken in a centrifuge tube and weight was recorded. Six mm of refined oil was added to the flour and centrifuged at 4000rpm for 25min. Free oil was decanted and weight of the centrifuge tube was noted

Fat absorption capacity of the seed flour was calculated as:

$$\%\text{fatabsorptioncapacity} = \frac{\text{wt of sample after centrifugation} - \text{wt of sample before centrifugation}}{\text{wt of the sample}}$$

#### 3.4.4 Swelling Power and Pecent Solubility of Seed Flour

Swelling power and per cent solubility of seed flour was determined according to the method of Schoch (1994).About 500 milligrams (W1) of jack seed flour was taken in a centrifuge tube and weighed the centrifuge tube with sample (W2) and 20ml of distilled water was added. Then it was allowed for 30min in a boiling water bath at 100°C. The contents were cooled and centrifuged at 5000rpm for 10min. The supernatant was carefully decanted in a test tube. The

water adhering to the sides of centrifuge tube was wiped well and weight of the centrifuge. The swelling power of seed flour per gram was calculated by the formula

Swelling power (g/g) = $\frac{W3-W2}{W1}$

Where,

W1 = Weight of seed flour sample
W2 = Weight of the centrifuge tube with seed flour sample
W3 = Weight of the centrifuge tube with swollen material

For per cent solubility of seed flour, the dried petriplate was weighed (W4) and 10ml of supernatant (VA) was pipetted into the petriplate. Then it was dried at 105°C in a hot air oven till constant weight was attained and cooled in a descicator and again weighed the petriplatewith dry solids (W5).The per cent solubility of the supernatant was calculated by,

% solubility= $\frac{W5-W4}{Va} * \frac{100}{W1}$

W1 = Weight of seed flour sample
W4 = Weight of the petriplate
W5 = Weight of the petriplate with dry solids
VE = Volume of water added
VA = Volume of supernatant taken

### 3.5 Use of Jack Fruit Seed Flour in Bread and Biscuit

The flour obtained is used in making bread and biscuit.

#### 3.5.1 Biscuit making process:

The wheat flour is weighed and jack fruit seed flour is added in various proportions (10%, 20%), the dry ingredient along with salt baking powder is sieve together through 1mm sieve. Then it is kneaded with the shortened hydrogenated fat. Its kneaded to a soft dough with required amount of milk. The dough is rolled out using a roller into a thin sheet of uniform thickness. Then it is cut into desired shape by using biscuit cutter. The biscuits are baked at $150^0$c temperature in an oven. The biscuits are packed and stored at room temperature.

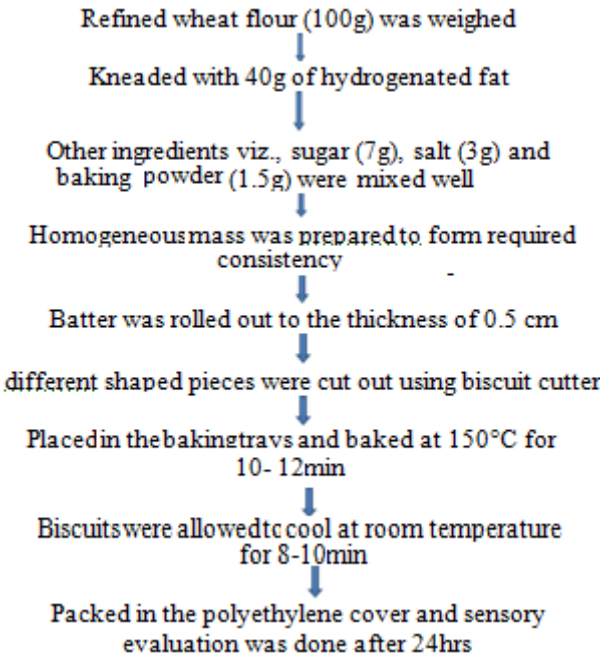


**Figure 3.5.1:** biscuit making process

#### 3.5.2Bread Making Process

The wheat flour is weighed and the jack fruit seed flour is incorporated in various proportions. This flour is sieved along with salt through 1mm sieve. The yeast is activated with warm water and sugar, and kept aside in darkness for activating yeast for 20min. the fat is shortened with sugar meanwhile.

When once the yeast is activated, the flour is mixed with fat and now activated yeast is added and kneaded by adding milk. The dough is kneaded to get a uniform consistency. The dough is now left for proofing foe 45min, during which the volume of the dough raises to double. The dough thus scaled into required weight and shape and placed in a greased mould and left for mould proofing for 10min. the breads are baked at $170^0$c in an oven for 20min. the process flow chart is given in fig 3.5.2

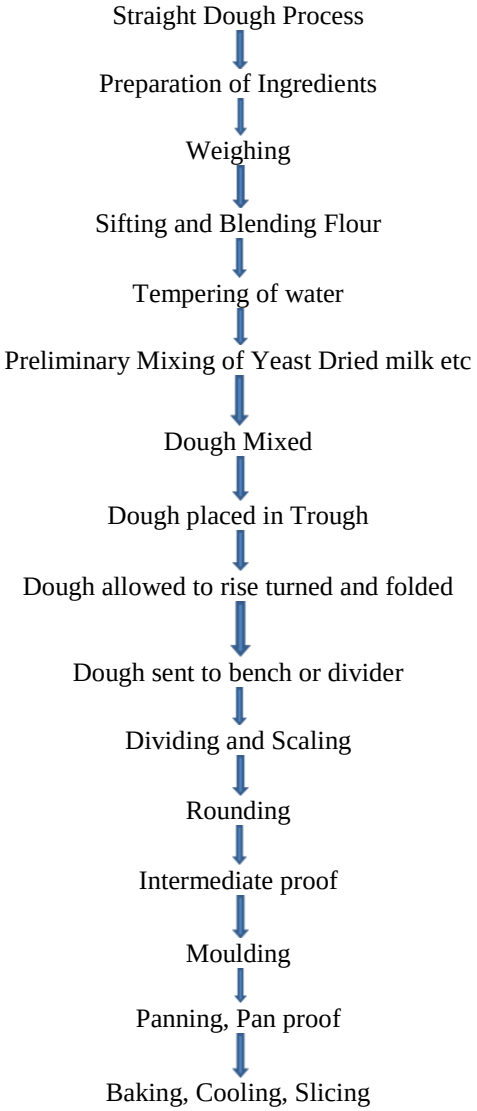


**Figure 3.5.2:** flow chart for bread (straight dough method)

## 4. Quality Analysis

### 4.1 Proximate analysis of product

#### 4.1.1 Moisture content

Moisture content of the product was determined according to oven method .A sample of 3gm was accurately weighed into

a clean dry petri dish and dried in an oven at $100^0$c for 2-3 hours, and cooled in desiccator and weighed till consecutives weights were obtained.

$$\% \text{ moisture of sample} = \frac{\text{initial weight} - \text{final weight}}{\text{sample weight}} * 100$$

**4.1.2 Fat content (soxhlet apparatus)**

2gm of powdered sample was weighed accurately into a dry thimble & extracted using petroleum ether ($60 - 80^0$ c boiling range) as solvent for 3 hours.The fat extract was collected in a previously weighed dry flat bottom flask and separated from the solvent by evaporating over a hot water bath. The flask was dried in an oven at $80 - 100^0$c and cooled till constant weight was obtained.

$$\% \text{ fat present} = \frac{\text{final weightof beaker} - \text{empty weight of beaker}}{\text{sample weight}} * 100$$

**4.1.3 Protein- micro kjeldhal method**

**a) Digestion**

Weigh 0.5or 1gm of sample and transfer to the digestion tube .Add 10-15ml of conc. sulphuric acid and 5-7gm of digestion activator, load the digestion tube to the digester and heat the digestion block. The sample turns colorless or light green color at the end of digestion.

**b) Distillation**

During distillation the ammonium radicals are converted to ammonia under excess alkali condition. After neutralization, acid in the digested sample with 40% NaOH on heating, the digested sample are heated by passing steam and ammonia liberated due to addition of 40% NaOH is dissolved in 4% in Boric acid.The Boric acid consisting of ammonia is taken for titration.

**c) Titration**

Titrate the solution of Boric acid and mixed indicator containing the liberated ammonia against 0.1N HCl. Determine the titrate value of blank solution of Boric acid and mixed indicator.

$$\% \text{ of nitrogen present in sample} = \frac{(\text{sample titre value} - \text{blank titre}) * \text{N of HCl} * 14}{\text{sample weight} * 1000} * 100$$

The % of nitrogen of protein in the sample =%Nitrogen *correction factor.

**4.1.4Total ash**

Weigh accurately 5gm of sample in a clean dry porcelain dish or silica dish. Ignite the material on the dish with the flames of suitable burner for about 1 hour. Complete the Ignition by keeping in muffle furnace at $550^0$c untill grey ash results(5-6 hours). Cool in dessicator and weigh till the consecutive weights are obtained.

$$\% \text{ of ash} = \frac{\text{weight of ash}}{\text{sample weight}} * 100$$

**4.1.5Carbohydrate**

Weigh 100mg of sample and place it in boiling test tube. Hydrolyze by keeping it in a boiling water bath for 3hour with 5ml of 2.5N HCl and cool to room temperature. Neutralize it with solid $Na_2Co_3$ until the effervesces ceases. Make up the volume to 100ml and then centrifuge. Collect the supernant and take 0.5ml and 1ml aliquots. Prepare the standards by taking 0.2-1.0ml and run blank simultaneously and make up the volume in all the tubes to 1ml with distilled water. Then add 4ml of Anthrone reagent and heat for 8min in a boiling water bath. Cool the tubes under tap water and read the absorbance at 630 nm. Draw standard curve by plotting conc. Of standard on X-axis and absorbance on Y-axis. From the graph calculate the amount of carbohydrate present in the sample tube.

$$\text{Mg of glucose} = \frac{\text{O.D of sample}}{\text{O.D of standard}} * \text{concentration of standard}$$

$$\text{Amount of carbohydrate in 100gm of sample} = \frac{\text{mg of glucose}}{\text{gm of sample}} * 100$$

**4.1.6 Crudefibre**

Weigh 2gm of fat free sample (W) in a triplicate and digest with 200ml of 1.25% sulphuric acid by gently boiling for half an hour. Then filter the contents through a filter paper then transfer to the same beaker to which adds 200ml 1.25% sodium hydroxide and boil for 30min. Digest the contents again for half an hour, filter and wash free of alkali using hot distilled water. Dry the residue in a hot air oven at $110^0$c. weigh and then place in themuffle furnace at $550^0$ c for 20min. The loss in weigh(W1gm) after ignition represents the crude fibre in the sample.

$$\% \text{ crude fibre} = \frac{W1}{W} * 100$$

## 5. Results and Discussion

### 5.1 Product development

Jack fruit seed flour biscuit and bread is prepared by incorporating jack fruit seed flour in various proportions in wheat flour. The product developed is shown in plate 1-3

**Plate 5.1:**(i) 10% jsf biscuit **Plate 5.1:** (ii) 20% jsf biscuit**.**

**Plate 5.1**: (iii) 10% & 20% jsf bread

### 5.2 Flour Evaluation

The flour obtained from jack fruit seed is evaluated for its quality parameters such as water absorption capacity, swelling power, oil absorption capacities, percent solubility, flour dispersibility and viscosity of the seed flour .

**Table 5.2** : Physical Parameter

| S.No | Parameter | Flour value |
|---|---|---|
| 1 | Water absorption capacity | 104.30 |
| 2 | Oil absorption capacity | 116.0 |
| 3 | Dispersibility | 25.2 |
| 4 | Swell power | 3.62 |
| 5 | Percent solubility | 1.66 |

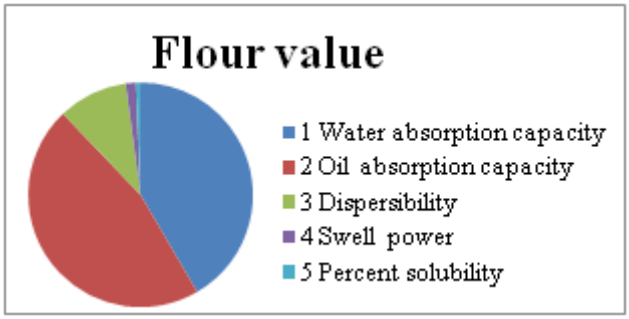


**Figure 5.2:** Flour Evaluation

Results of the experiments to assess the water and oil absorption capacities, dispersibility, swelling power and per cent solubility of jack seed flour is depicted in the Table 6.2 . The value for the water absorption capacity of the flour recorded 104.30ml/100g where as, higher value ( 116.ml/100g) was recorded for oil absorption capacity. The dispersibility of the seed flour noted 25.2 per cent. The swelling power (3.62 g/g ) of the seed flour was higher than the per cent solubility (1.66 %).

### 5.3Product Evaluation

The products are evaluated by proximate analysis as well as sensory evaluated.

### 5.3.1 Proximate Analysis

Results obtained from proximate analysis for bread and biscuits for various incorporation are given in the table(5.3.1). And nutritional comparison is presented in fig 5.3.1

### 5.3.1.1Analysis of jack fruit seed flour incorporated biscuits:

| | Control | 10%jsf | 20%jsf |
|---|---|---|---|
| Protein | 11.6 | 11.42 | 11.2 |
| Fat | 41.7 | 41.72 | 41.8 |
| carbohydrate | 81.15 | 80.7 | 80.4 |
| Ash | 0.76 | 1 | 1.2 |
| crude fibre | 0.3 | 0.52 | 0.75 |

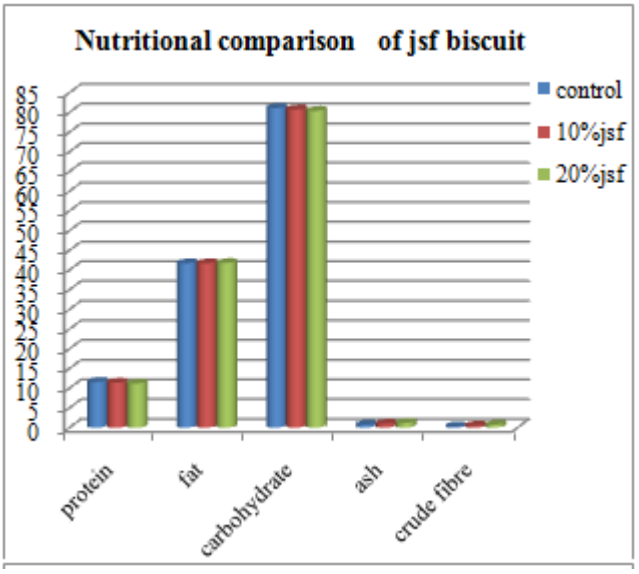


**Figure 5.3.1:** Nutritive value of biscuits

The results obtained from the proximate analysis reveals that the incorporation of the jack fruit seed flour increases the ash and crude fibre in the formulated biscuits. The high ash content could be attributed to the more mineral content of the seed flour. The crude fibre is increased as the jack fruit seed is rich in crude fibre.
The incorporation also leads to the decrease in the level of protein, carbohydrate in the jack fruit seed flour biscuits.

**Table 5.3.1.2:** Nutritive values of bread

| | Control | 10%jsf | 20%jsf |
|---|---|---|---|
| Moisture | 31.1 | 34.09 | 34.54 |
| Protein | 14.5 | 13.8 | 13.7 |
| Fat | 1.4 | 1.23 | 1.22 |
| carbohydrate | 51 | 49 | 49.48 |
| Ash | 0.9 | 1.03 | 1.03 |
| crude fibre | 1.95 | 2.49 | 2.78 |

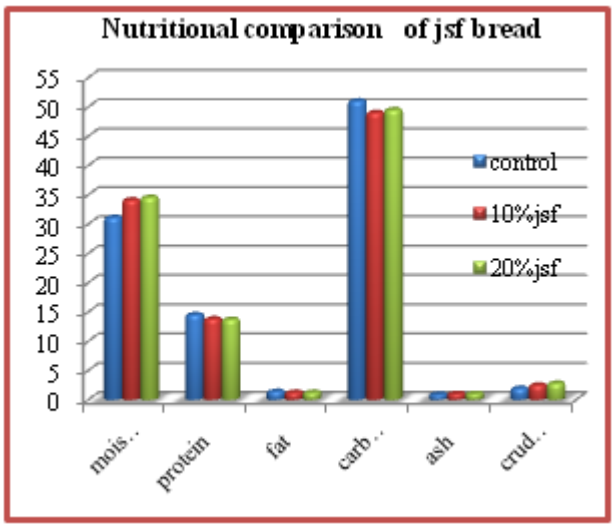


**Figure 5.3.1.2:** Nutritional comparison of bread

The jack fruit seed flour found to increase the crude fibre content of the bread. The bakery products lack in the dietary

fibre so the jack fruit seed flour has been incorporated to increase the dietary fibre in the product.

### 5.4 Sensory evaluation

The products obtained after baking was subjected for sensory evaluation. The formulated bread and biscuits were compared with the control samples i.e without jack fruit seed flour. The score record sheet were prepared based on the nine point hedonic scale-

## 6. Discussion

The bakery products such as biscuits and bread have become very popular in India in all socio-economic section of population. Thus for potential and economic exploitation, jack seed flour in biscuit preparation is more practical and hence an effort was made to blend wheat flour with jack seed flour. The preliminary product development studies indicated use of non-gluten flour in biscuit beyond 30 per cent was not acceptable.

Reasons for addition of fibre in baked products to increase DF & decrease calorie JSF, good source of dietary fibre, easy to process, can be incorporated into bread without affecting eating quality. JSF contribute to the development of value added food or functional food - currently high demand e.g bread and biscuits - selected because it's easy to process & eaten by all age group

JSF - good source of fibre, low fat content Incorporation JSF in bread and biscuits gave an outstanding eating quality in term of colour, taste, high in fibre & low fat, hardening tendency reduced level of DF

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