

Original Research Article

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## Microbial and Sensory Evaluation of Kujithekera (*Garcinia cowa* Roxb)

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### ABSTRACT

*Kujithekera* (*Garcinia cowa* Roxb.) commonly known as Cowa is a very well known underutilized tropical fruit of Northeast India. It is sub acid in taste with immense medicinal properties. Hydroxycitric acid (HCA) is a principal factor of this fruit which acts as an anti-obesity factor. The aril portion can be eaten locally and can be prepared jellies and pickles out of it. Cowa fruits are very perishable in nature and have a very short shelf life. Considering its potential medicinal properties a work has been carried out where various post harvest treatments are used and fruits were packed in transparent perforated (0.2% ventilation) low density polyethylene bags (25 $\mu$ ). At an interval of 2 days sensory evaluation has been done throughout the storage and when decaying starts, growth of two organisms viz. *Penicillium italicum* and *Penicillium digitatum* was observed, which were found through microbial analysis. Fruits dipped in 1 per cent wax emulsion for 5 min, air dried and packed in transparent perforated (0.2% ventilation) LDPE bags (25 $\mu$ ) were found to have the maximum shelf life (6 days) and also growth of the organisms here were seen at last amongst the other treatments.

#### Keywords

Cowa fruits, *Garcinia*, Konkan region, Organic acid, Polygamous trees, Herbs

#### Article Info

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### Introduction

Kujithekera (*Garcinia cowa* Roxb), commonly known as Cowa is one of the important indigenous fruits of Assam. The genus *Garcinia* (Family: Clusiaceae) consists of over 200 species mainly in Asia, Africa, and Polynesia. These are evergreen polygamous trees, herbs, and shrubs. In India 35 species are reported, many of which are

important economically with immense medicinal properties (Roberts *et al.*, 1984). Cowa fruits are very rich in nutritional as well as medicinal properties and also earn income in the rural areas. Hydroxycitric acid (HCA), an anti obesity factor, is the principle organic acid of some *Garcinia species*. It is present in the fruit and leaves of *Garcinia* and is known to inhibit lipid and fatty acid synthesis in living systems (Lewis and Neelakantan,

1965). The fruits are edible with a sour taste. Many species of *Garcinia* have fruit with edible arils and are eaten locally. Fruit and syrup of *G. indica* are very popular in Konkan region and are antioxidant and antibacterial (Negi *et al.*, 2008). For culinary and traditional medicine *kujithekera* plays a vital role for the residents of Northeast India. Fruits and leaves are used for the improvement of blood circulation as an expectorant for the treatment of coughs and indigestion and as a laxative, while the root is used for fever relief. Most of the species in *Garcinia* are known for their gum resin which is used as purgative or cathartic. The fruits are not palatable because of their acidic flavour. They can be made into jams and preserves.

There have been hundreds of studies on extraction, determination of chemical components of the organic compounds, application to food technology, pharmaceutical technology, but most especially to slimming products. However, information on shelf life is very limited. These are easier to grow and hardy in nature but the dark side about them is that majority of the population do not know about the benefits of these fruits and hence are not yet commercialized. They are just grown in the backyard of the house in homestead gardens with least care and management. Lack of knowledge, coupled with habitat destruction, leads to genetic erosion of this forest resource and many species are threatened (Cheek, 2004).

The fruits are highly perishable in nature having short shelf life. Keeping in view of such objectives this study has been carried out where attempts have been done to extend the shelf life with the various post harvest treatments. Also, certain factors like taste, texture and visual colour has been studied throughout the storage period along with the microbial evaluation after storage.

## Materials and Methods

Cowa is a middling sized evergreen tree with an oval crown and dark brown green foliage. Fruits are drupe and ovoid globosely.

On maturity it turns to opaque red and slightly tapering. Inside its orange when ripe, 4-6 seeded crowned by the persistent stigma. Aril is present inside the fruit which is covered by the rind portion. The aril could be easily detached from the rind portion. Rind is very sour in taste but the aril is sub acid. Fresh *Kujithekera* fruits reaching colour break stage with equal maturity and size were collected from the orchard of Department of Horticulture, Assam Agricultural University.

The harvested fruits were washed properly and allowed to air dried. Then these are subjected to various post harvest treatments air dried and packed in perforated (0.2%) LDPE bags (100 gauge) and kept at ambient conditions ( $29.8 \pm 1.1^{\circ}\text{C}$ ,  $\text{RH } 79.6 \pm 3\%$ ).

The treatments undertaken were T1: Dipping the fruits in 100 ppm sodium hypochlorite ( $\text{NaOCl}$ ) solution for 5 min, air dried and packed, T2: Dipping the fruits in 2 per cent calcium chloride ( $\text{CaCl}_2$ ) solution for 5 min, air dried and packed, T3: Dipping the fruits in 1 per cent wax emulsion for 5 min, air dried and packed, T4: Fruits packed without any chemical treatment, T5: Fruits kept in an open tray without packaging and chemical treatment. Fruits were analyzed for HCA, titratable acidity, ascorbic acid, and sensory parameters based on visual observation and were scored at 9.0 hedonic scale at 2 days interval up to 6 days. Also, a microbial study was done at the end *i.e.* after 6 days of storage to detect the organism which fastens the rotting process and degrades fruit quality. The experiment was conducted under factorial Completely Randomized Design with 4 replications.

## Sensory evaluation

Sensory evaluation of the fruit was done by a group of semi trained panels for taste, texture and visual colour using 9 point (1=dislike extremely, 9=like extremely) hedonic scale (Amerine *et al.*, 1965).

Attributes	Score
Like extremely	9
Like very much	8
Like moderately	7
Like slightly	6
Neither like nor dislike	5
Dislike slightly	4
Dislike moderately	3
Dislike very much	2
Dislike extremely	1

Overall acceptability was determined by taking the average of taste, texture and visual colour scores.

## Microbial evaluation

Fungal microflora associated with the surface of *Kujithekera* fruits were studied on the 6<sup>th</sup> day after storage at the Laboratory of Dept. Of Plant Pathology, AAU, Jorhat. Fruits are kept under moist condition overnight, scraped the superficial growth of fungi and then placed on a grease free slide containing a drop of lactophenol cotton blue mount. After putting a cover slip, fungal population was studied under a compound microscope at 10X and 40X and compared the feature with the literature for identification.

## Results and Discussion

### Experimental findings and analysis

#### Sensory evaluation

Changes in sensory quality of fruits during storage are the most serious limitation of shelf life of the product, which in turn affects the

consumer acceptance. The taste of the fruits was found to decrease as the storage period advanced. It might be due to the decreasing sugar and TSS content which declines the taste. In the present study, fruit colour was also decreased during storage. Also, the increasing dominance of the microorganisms day by day and feeding on the nutritional components made the fruit loss its quality and appearance. Also, the oxidation of the phenolic compounds resulted in the degradation of the colour which later on turned into dark brown. The wax coated fruits (T3) were able to maintain its firmness throughout the storage because of the coating which restricted its respiration and loss of water and pectin. The least textured softest fruits (5.55) were observed in the non treated fruits (T5) on 6 days after storage with maximum water loss through the surface due to high rate of respiration (Table 1 and 2).

#### Microbial growth and rotting of fruits

Rotting of fruits is one of the major problem associated with the shelf life of the fruits. In the present research, the wax coated fruits (T<sub>3</sub>) showed no rotting of fruits. This might be due to the fact that the fruits under the treatment were found to be free from fungal growth (Table 3). The highest rotting percentage (90.10%) was recorded in non treated fruits (T5) which might be due to microbial growth *viz.* *Penicillium italicum* and *Penicillium digitatum* (Table 4).

Thus, it can be concluded that the fruits dipped in 1per cent wax emulsion for 5 min, air dried and packed in transparent perforated (0.2% ventilation) LDPE bags (25 $\mu$ ), appeared to be the best treatment for retention of sensory qualities like taste and texture and least microbial attack of *Kujithekera* fruits at six (6) days after storage. Calcium chloride treatment (T2) which gave the shelf-life of 5 days may alternatively be suggested for shelf-life enhancement of Cowa fruit.

**Table.1** Effect of post-harvest treatments on Taste in *Kujithekera* at different days after storage

Treatment	Pulp			
	Days in storage (S)			
	S <sub>1</sub> (2)	S <sub>2</sub> (4)	S <sub>3</sub> (6)	Mean
<b>T1</b>	8.50	8.12	8.00	8.20
<b>T2</b>	8.50	8.37	7.87	8.25
<b>T3</b>	8.75	8.50	8.13	8.46
<b>T4</b>	7.75	7.75	7.75	7.75
<b>T5</b>	7.75	7.12	7.75	7.54
<b>Mean</b>	8.25	7.98	7.90	

Initial values (0 day) 8.88

	S. Ed (±)	C. D at 5%
T	0.18103	0.36533
S	0.14022	0.28298
T × S	NS	NS

NS: Non significant

**Table.2** Effect of post-harvest treatments on Sensory evaluation (Texture and Visual colour) in ‘Kujithekera’ at different days after storage

Treatment	Texture				Visual colour			
	Days in storage (S)				Days in storage (S)			
	S <sub>1</sub> (2)	S <sub>2</sub> (4)	S <sub>3</sub> (6)	Mean	S <sub>1</sub> (2)	S <sub>2</sub> (4)	S <sub>3</sub> (6)	Mean
<b>T1</b>	7.75	7.25	6.12	7.04	7.87	6.62	5.52	6.67
<b>T2</b>	8.25	7.25	6.62	7.38	8.12	7.00	5.75	6.95
<b>T3</b>	8.87	8.75	8.25	8.63	8.50	8.25	8.00	8.25
<b>T4</b>	7.62	7.00	5.62	6.75	7.50	5.75	5.25	6.16
<b>T5</b>	6.87	6.75	5.50	6.38	6.20	5.55	5.00	5.37
<b>Mean</b>	7.87	7.4	6.4		7.57	6.63	5.90	

Initial values (0 day) 8.88 8.5

	S. Ed (±)	C. D at 5%	S. Ed (±)	C. D at 5%
T	0.13	0.26	0.19	0.39
S	0.10	0.20	0.15	0.30
T × S	0.22	0.45	0.33	0.67

**Table.3** Effect of post-harvest treatments on Rotting (%) in Kujithekera at 6 days after storage

Treatment	Rotting %
	Days in storage (S)
	S <sub>3</sub> (6)
<b>T1</b>	40.25
<b>T2</b>	30.42
<b>T3</b>	5.37
<b>T4</b>	50.75
<b>T5</b>	90.10

**Table.4** Microflora associated with the stored 'Kujithekera' fruits at 6 days after storage

Treatment	Observations/symptoms	Organisms identified
<b>T1</b>	Major portion of the fruit was covered with the microbes alongwith rotting	<i>Penicillium digitatum</i>
<b>T2</b>	Black scars covers a major portion where the fungus started growing was seen.	<i>Penicillium italicum</i>
<b>T3</b>	Fruits remained fresh till 6 days after storage without any microbial attack	No organisms found
<b>T4</b>	Rotting and continuous oozing of watery substances took place	<i>Penicillium italicum</i> and <i>P. digitatum</i>
<b>T5</b>	A huge population of microorganisms over the whole fruit. The fruit is covered with a green velvety like layer.	<i>Penicillium italicum</i> and <i>P. digitatum</i>

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