Sensory evaluation of clarified banana (Musa paradisiaca L.) juice prepared using enzymes

Bharai Rambhai B, Kothariya Bhavesh H, Shakti S Arbat, Jilen M Mayani and Dev Raj

Abstract
The present investigation entitled “Sensory evaluation of clarified banana (Musa paradisiaca L.) Juice prepared using enzymes” was aimed to standardize formulation for the preparation of clarification juice from banana. Clarified i.e. banana juice prepared by using different concentration of enzyme pectinase @ 0%, 0.5%, 1% and cellulase 0%, 0.5%, 1% for changes in sensory qualities during storage period of 6 months at room temperature. Banana clarified juice were prepared using enzymes concentration with different nine treatments. The juice was extracted using muslin cloths and hand pressing of banana pulp. Clarified banana juice pasteurization and packed in glass bottle stored room temperature for six month and periodically evaluated for its sensory quality. Sensory parameters were found decreasing trend during six months of storage. CoP: i.e. (cellulase: pectinase, 0:1%) was rated best treatment on the basis of higher sensory scores of colour, taste, flavour and overall acceptability. According to above, it may be suggested that for clarified banana juice using of can be prepared by of the proportion of 1 per cent pectinase.

Keywords: Banana, clear juice, enzymes, pectinase, colour, taste, flavor

Introduction
Banana (Musa paradisiaca L.) is a large herbaceous perennial monocotyledonous and monocarpic plant. Banana belongs to family Musaceae in order Scitamineae. Banana is known as “Apple of Paradise” and “poor man’s apple”. Origin is in the tropical region of South-East Asia many consider banana as one of the man’s first food. The postharvest management of banana require proper infrastructure like pre cooling chamber, hot water treatment plant, irradiation unit, packaging house and storage house. The most of the banana fruit is consumed as fresh and very small amount is being processed in to value added products i.e. Banana puree, powder, wafers, wine, figs, jam, canned slices, dehydrated banana slices, flakes, beverages, vinegar and fruit bar etc.

The enzymes are used in processing agricultural and agro-industrial waste, clarification of fruit juices and wines, extraction of vegetable oils, reduction of viscosity of concentrates, fermentation of coffee and tea, production of paper, treatment of natural fibers (linen and remie fibers) and degumming of plant fibers (Jin and Masako, 2001). Pectinases have extensive applications in fruit juice industries in order to improve fruit juice yield and clarify. The use of liquefying enzymes for mash treatment results in improvement of free flowing juice flow which leads to a lower press time even in absence of suitable pressing aids. At the same time pectin is broken down into such an extent that the viscosity of mash is considerably reduced (Sartoglu et al., 2001) [8].

Enzymes are expensive products and clearly juice manufacturers would wish to minimize their costs by using the enzymes at their optimum conditions and therefore maximizing their effectiveness and re-using the enzymes (Blandino, 2001) [9]. Clarification is a beneficial step in juice processing and improvement of consumer acceptability. It is often achieved through enzymatic treatment, membranes filtration, or using clarifying aids. The use of commercial pectin enzymes is common in fruit juice processing. The advantages of pectin enzyme use have been to increase the flow of juice, clarity, improve juice yield, and facilitate filtration (Alkorta et al., 1998) [2].

Material and method
Mature fruits of banana were used for extraction of pulp. The fruits were washed in running water to remove adhering dirt and dust particles. Then pulp was extracted by manually.
Clarified juice of banana prepared from extraction of banana pulp. The procedure of juice was described in figure 1. Total nine treatments were used for preparation of juice using different concentration of enzymes.

<table>
<thead>
<tr>
<th>No. of Treatments</th>
<th>Treatments Combination</th>
<th>Details of treatment combination</th>
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<tbody>
<tr>
<td>T₁</td>
<td>C₀P₀</td>
<td>Control</td>
</tr>
<tr>
<td>T₂</td>
<td>C₀P₁</td>
<td>Cellulase 0 % + Pectinase 0.5 %</td>
</tr>
<tr>
<td>T₃</td>
<td>C₀P₂</td>
<td>Cellulase 0 % + Pectinase 1 %</td>
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<tr>
<td>T₄</td>
<td>C₁P₀</td>
<td>Cellulase 0.5 % + Pectinase 0 %</td>
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<tr>
<td>T₅</td>
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<td>T₆</td>
<td>C₂P₀</td>
<td>Cellulase 1 % + Pectinase 0 %</td>
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<td>T₇</td>
<td>C₂P₁</td>
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<td>T₈</td>
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<tr>
<td>T₉</td>
<td>Control</td>
<td>Cellulase 1 % + Pectinase 1 %</td>
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</table>

Sensory parameters changes in clarified banana juice during storage

**Selection of the mature banana fruits**

- Washing of banana fruits
- Sorting
- Removal of peel
- Crushing of fruits
- Enzyme treatment
- Extraction of clear juice
- Pasteurization
- Filling the product in sterilized transparent glass bottles
- Crown corking
- Processing
- Cooling and labelling
- Stored the product in cool, dry place at ambient temperature

**Fig 1:** Principal step of juice clarification of banana juice

### Results and Discussion

#### Colour (out of 9 points)

The score of colour in clarified banana juice was found significant. The colour (out of 9 points) contains was found highest in C₀P₁ i.e. (pectinase: cellulase, 1:0) which was at par with C₂P₂ i.e. (pectinase: cellulase, 1:1) and minimum in C₁P₀ i.e. (pectinase: cellulase, 0:0.5). The colour score of the product was decreased significantly irrespective of the treatment up to the end of the six-month storage. Moreover, the highest colour score was recorded in C₀P₁ i.e. (pectinase: cellulase, 1:0) which could be mainly due to the enzyme like pectinase breakdown the particles, hence improve the sensory qualities in terms of colour. The lowest colour score was recorded in C₁P₀ i.e. (pectinase: cellulase, 0:0.5) which could be mainly due to the enzyme like cellulase its give dark colour. The pattern of decline of colour during storage might be due to the oxidation, which was responsible for increase the production of black compounds resulting in browning of product during long term storage and thus it’s adversely affected on colour acceptance. These observations were also similar to finding of Sin et al. (2013) [¹] clarification of sapodilla juice, Vaidya et al. (2009) in enzymatic extraction of kiwifruit juice, Joshi et al. (2011) [⁶] in pectinase enzyme on clarification of apple juice, Akesowan and Choonhahirun (2013) [¹] pectinase enzyme on clarification of guava juice, Egowim et al. (2013) [⁴] clarification of banana juice, Kadam et al. (2014) [⁷] in effect of pectinase enzyme on clarification of grape juice, Sharma et al. (2015) [⁹] in enzymatic extraction and clarification of juice from various fruits, Sherpa et al. (2014) [¹⁰] in enzymes assisted juice extraction from plum.

**Table 1:** detail of Treatment formulation used for banana clarified juice

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**Fig 2:** Effect of enzyme on colour of clarified banana juice during storage

#### Taste (out of 9 points)

The score of taste in clarified banana juice was found significant. The maximum taste score was recorded in C₀P₁ i.e. (pectinase: cellulase, 0.5:0) which was at par with C₂P₂ i.e. (pectinase: cellulase, 1:1). However, the minimum score in C₁P₀ i.e. (pectinase: cellulase, 0:0.5). The taste score of the product was decreased significantly irrespective of the treatment up to the end of the six-month storage. Moreover, the highest taste score was recorded in C₀P₁ i.e. (pectinase: cellulase, 0.5:0) may be due to the pulp particles contain air and later on results in the development of oxidative changes. The lowest taste score was recorded in C₁P₀ i.e. (pectinase: cellulase, 0:0.5) may be due to the enzyme like cellulase its give bitter taste. The pattern of decline of taste during storage might be due to the biochemical changes like increase in TSS, sugars and acidity as well as decrease ascorbic acid during storage. These observations were also similar to finding of Sin et al. (2006) [¹¹] clarification of sapodilla juice, Vaidya et al. (2009) in enzymatic extraction of kiwifruit juice, Joshi et al. (2011) in pectinase enzyme on clarification of apple juice, Egwim et al. (2013) [⁴] clarification of banana juice, Kadam et al. (2014) [⁷] in effect of pectinase enzyme on clarification of grape juice, Sherpa et al. (2014) [¹⁰] in enzymes assisted juice extraction from plum.

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Flavour (out of 9 points)
The score of flavour in clarified banana juice was found significant. The flavour (out of 9 points) contain was found significantly highest in C<sub>p2</sub> i.e. (pectinase: cellulase, 1:0) which was at par with C<sub>p1</sub> i.e. (pectinase: cellulase, 0.5:0) and minimum score in C<sub>p0</sub> i.e. (pectinase: cellulase, 0:0). The flavour score of the product was decreased significantly irrespective of the treatment up to the end of the six months storage. Moreover, the highest flavour score was recorded in C<sub>p2</sub> i.e. (pectinase: cellulase, 1:0) may be due to the pulp particles contain air and later on results in the development of oxidative changes. The lowest flavour score was recorded in C<sub>p2</sub> i.e. (pectinase: cellulase, 0:0) may be due to enzymes concentration was zero. The pattern of continuously decrease in flavour score during storage might be due to the loss of highly volatile aromatic compound which is very sensitive to high storage temperature. Similar types of results were also in accordance with Sin et al. (2006) clarification of sapodilla juice, Vaidya et al. (2009) in enzymatic extraction of kiwifruit juice, Joshi et al. (2011) in pectinase enzyme on clarification of apple juice, Egwim et al. (2013) clarification of banana juice, Kadam et al. (2014) in effect of pectinase enzyme on clarification of grape juice, Sherpa et al. (2014) in enzymes assisted juice extraction from plum.

Overall acceptability (out of 9 points)
The score of overall acceptability in clarified banana juice was found significant. The overall acceptability contain was found highest in C<sub>p2</sub> i.e. (pectinase: cellulase, 1:0) which was at par with C<sub>p1</sub> i.e. (pectinase: cellulase, 0.5:0) and minimum score in C<sub>p0</sub> i.e. (pectinase: cellulase, 0:0). The overall acceptability score of the product was decreased significantly irrespective of the treatment up to the end of the six months storage. In overall acceptability of juice considering the colour, taste and flavor the treatment C<sub>p2</sub> i.e. (pectinase: cellulase, 1:0) was found more acceptable. It may be due to the enzyme like pectinase breakdown the particles, hence improve the sensory qualities in terms of sensory. The lowest overall acceptability score was reported in C<sub>p0</sub> i.e. (pectinase: cellulase, 0:0.5) may be due to the enzyme like cellulase it’s give bitter taste and dark colour which was responsible for lowest acceptance in the overall acceptability of juice. The pattern of continuously decrease in overall acceptability score during storage might be due to the decline the all sensory parameters like colour, taste and flavour with increasing storage period. Such identical findings were also revealed by Sin et al. (2006) clarification of sapodilla juice, Vaidya et al. (2009) in enzymatic extraction of kiwifruit juice, Joshi et al. (2011) in pectinase enzyme on clarification of apple juice, Egwim et al. (2013) clarification of banana juice, Kadam et al. (2014) in effect of pectinase enzyme on clarification of grape juice, Sherpa et al. (2014) in enzymes assisted juice extraction from plum.

References


