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# Utilization of Left over Peach Pulp for Making Puree after Canning of Peach–Halves in Peach Fruit Juice

**Shahida Choudhury [a++*], Bidyut C. Deka [a#] and Akali Sema [b†]**

*[a] Assam Agricultural University, Jorhat-13, Assam, India.*
*[b] School of Agricultural Science and Rural Development, Medziphema, Nagaland, India.*

***Authors' contributions***

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## ABSTRACT

Peach fruits of the cultivar TA-170 were lye peeled and canned in A2 ½ tin cans with a covering medium of $40^0$ Brix containing enzymatically extracted fruit juice in a concentration of 30-40 per cent with or without ascorbic acid (500 ppm) and compared with the control ($40^0$ Brix of sucrose syrup + 0.3% citric acid). Cut out analysis carried out upto 6 months with 2 months storage interval, revealed that all the treatments met FPO specification for drained weight and showed superiority in quality over conventional canned peaches. The vitamin C fortified treatments had a higher retention of ascorbic acid throughout the storage as compared to the unfortified treatments. In comparison to peach halves canned in juice with or without ascorbic acid in the covering medium, more non-enzymatic browning was seen in the peach halves canned in plain sucrose syrup.

*[++] Assistant Professor;*
*[#] Vice Chancellor;*
*[†] Professor & Dean;*
**Corresponding author: E-mail: Choudhury.shahida@gmail.com;*

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## 1. INTRODUCTION

Peach (*Prunus persica* Batsch*)* is the third most widely distributed temperate stone fruit in the world. The total world production of peach is 13.757 million tonnes and India contributes 1,14,000 metric tones [1]. In India, its cultivation is confined in the states of Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Tamil Nadu and parts of Uttarakhand. However, the low chilling peaches in India are grown in sub-mountainous region and parts of Uttar Pradesh. In the North East it is mainly grown in Arunachal Pradesh, Nagaland and Meghalaya covering an area of 600 ha with an annual production of 1,250 tonnes [2]. Low chilling peach is most important in terms of adaptability and extension of area as these peaches mature early in subtropical areas and thus find an excellent market. Peach is a delicious fruit of the world, which contains an appreciable amount of vitamin C *i.e* 1-27 mg/100 g, 7-8 per cent sugars, 0.6-1.2 per cent proteins and is rich in mineral contents and vitamins [3]. Peaches like other stone fruits can not endure long storage life after harvest at ambient temperature as they are subjected to softening and senescence breakdown immediately after harvest. In addition, there is often a glut in the peach market during the peak harvest season, as it has very short shelf life due to its perishable nature and there is a high post harvest loss. Therefore, to make fruits available throughout the year to consumers and for better return to growers, preservation of fruit halves in fruit juice and conversion of the pulp to puree could be an attractive alternative. Some workers have suggested replacement of sugar syrup with corn syrup in canning of fruits. Peach halves have been canned in juices of apples [4]. 20-30 per cent of the apple juice concentrate of $35^0$B as covering medium has been successfully used in canning of apple rings. The present investigation was carried out to explore the feasibility of using peach juice at different levels, in the canning of peach halves to obtain a product having good nutrition with better retention of quality during storage and also aimed at economic utilization of the peach pulp and processing it into puree.

## 2. MATERIALS AND METHODS

### 2.1 Preparation of Fruit, Pulp and Juice

Peach fruits of ripe and firm cultivar TA-170 were obtained from Horticultural Research farm, ICAR Research complex for NEH Region, Umiam (Meghalaya). The peach fruits of sound quality were sorted manually at the first step, followed by the other handling practices such as grading, washing and lye-peeling. Lye-peeling was done using 1.0 per cent boiling caustic soda and dipping fruits for short timings of 50-60 seconds. Then these fruits were made into halves and the pits were removed. Pulp Extraction using 10 per cent water was done for partial amount of peach fruits and cooked for 10-15 min, passed through the pulper, pasteurized for 20 min. The pulp was treated with pectinase (0.5 per cent) for juice extraction from the pulp and incubated at $40^0$Cfor 4 hours. Then from the said enzyme treated pulp juice extraction was done which was passed through muslin cloth. To inactivate the added enzyme the extracted juice was heated to $95^0$C, pasteurized for 20 min and then stored in glass bottles which were sterilized. The left over pulp after extraction of juice was also collected and stored.

### 2.2 Packing and Processing

A 2 ½ cans were used for packing the Lye peeled peach halves. 2 ½ cans were filled up with a covering medium of $40^0$B strength containing 30-40 per cent peach juice, consisting of with or without 500ppm ascorbic acid. The conventionally canned samples consisted of covering syrup of $40^0$B strength (prepared with sucrose and 0.3 per cent citric acid) which was used as the control. For peach puree only the prepared pulp were used in same proportions (200gm) with sugar and without sugar maintaining the final TSS at $15^0$B and with salt maintaining the final TSS at $11^0$Brix. The standard method/protocol was used for the processing of packed tin cans and puree bottles. Storage for 6 months of the processed cans and puree bottles were carried at ambient temperature (14.92 -$26.39^0$C). The experiment was replicated thrice.

### 2.3 Analysis

The procedures described by Ranganna [1] for the physico-chemical analysis of the fresh, canned fruits and also the peach puree were done. 7 semi-trained judges carried out by using the 9 point Hedonic scale [5] for accessing the overall acceptability evaluation of fruit halves and puree. The statistical analysis of Data's was done and Mean values were compared at 5 per cent level of significance.

## 3. RESULTS AND DISCUSSION

**Table 1. Physico- chemical characteristics of fresh peach fruit**

| Parameter | Mean | Standard deviation |
|---|---|---|
| Length, cm | 4.56 | .013 |
| Width, cm | 4.58 | .013 |
| Weight, g | 61.89 | 0.339 |
| Specific gravity | 1.01 | 0.062 |
| Pulp/stone ratio | 13.83 | 0.018 |
| Length/breadth ratio | 1.01 | 0.011 |
| Moisture, per cent | 87.55 | 0.148 |
| Total soluble solids, $^{0}$B | 13.43 | 0.162 |
| Titratable acidity, per cent as malic acid | 0.44 | 0.017 |
| Reducing sugar, per cent | 3.10 | 0.068 |
| Total sugars, per cent | 5.72 | 0.018 |
| Ascorbic acid, mg/100g | 45.69 | 0.016 |
| Total carotenoids, µg/100g | 23.54 | 0.149 |
| TSS/acid ratio | 29.86 | 0.017 |
| Firmness, N | 102.12 | 3.773 |
| Fruit Colour, | | |
| L | 46.25 | 5.727 |
| A | 7.45 | 0.068 |
| B | 6.20 | 0.175 |
| *Average value of 10 fruits | | |

**Table 2. Cut-out examination of canned peach halves after 6 months of storage**

| Parameter | Ascorbic acid, ppm | Concentration of juice , per cent | | Mean |
|---|---|---|---|---|
| | | 30 | 40 | |
| **Drained weight, per cent** | 0 | 56.94 | 57.86 | **57.40** |
| | 500 | 57.13 | 58.10 | **57.62** |
| | **Mean** | **57.04** | **57.98** | **CD $_{0.05}$ =0.046** |
| **Total soluble solids (TSS), per cent** | 0 | 22.21 | 24.69 | **23.45** |
| | 500 | 18.17 | 23.20 | **20.69** |
| | **Mean** | **20.19** | **23.95** | **CD $_{0.05}$ =0.047** |
| **Titratable acidity, per cent** | 0 | 0.229 | 0.237 | **0.233** |
| | 500 | 0.230 | 0.235 | **0.232** |
| | **Mean** | **0.229** | **0.236** | **CD $_{0.05}$ =0.006** |
| **Ascorbic acid, mg/100g** | 0 | 7.47 | 8.92 | **8.20** |
| | 500 | 16.09 | 22.50 | **19.30** |
| | **Mean** | **11.78** | **15.71** | **CD $_{0.05}$ =0.107** |
| **Non-enzymatic browning, optical density at 440 nm** | 0 | 0.161 | 0.108 | **0.135** |
| | 500 | 0.072 | 0.067 | **0.069** |
| | **Mean** | **0.117** | **0.088** | **CD $_{0.05}$ =0.0007** |
| **Overall acceptability score** | 0 | 5.65 | 6.11 | **5.88** |
| | 500 | 5.42 | 5.57 | **5.49** |
| | **Mean** | **5.54** | **5.84** | **CD $_{0.05}$ =0.007** |

**Drained weight, total soluble solids, titratable acidity, ascorbic acid, non-enzymatic browning and overall acceptability score for control samples after 6 months of storage was 54.77, 25.46, 0.313, 4.27 0.189 and 3.85 respectively.*

***Initial total soluble solids of covering media 40 per cent.*

****Control treatment (conventional canning media) contained 40$^{0}$B sucrose syrup having 0.3 per cent citric acid.*

**Table 3. Overall acceptability score of peach puree after six months of storage on 9 point hedonic scale and Bhowmik, Pan method [10]**

| Parameters | Treatments of peach puree | | | $CD_{0.05}$ |
|---|---|---|---|---|
| | With sugar | Without sugar | With salt | |
| Colour | 8.35 | 8.25 | 8.25 | 0.0084 |
| Flavour | 8.21 | 8.11 | 7.31 | 0.007 |
| Texture | 4.67 | 3.90 | 4.67 | 0.0056 |
| Taste | 8.50 | 7.53 | 7.00 | 0.049 |
| Overall acceptability | 8.75 | 7.53 | 8.00 | 0.031 |

## 3.1 Characteristics of Fruit

The physico-chemical characteristics of Fresh fruits were analyzed before canning and puree making and the results are summarized in Table 1. The average fruit length (170cm) and width of the peach cultivar TA-170 were 4.56 and 4.58 cm respectively. The weight and specific gravity of the fruits were 61.89 g and 1.01 respectively, with firmness of 102.12 N. The colour reflectance of the peach fruits was measured as the 'Hunter colour values (L,a and b). L is a measure of lightness on a scale ranging from 0(black) to 100 (white): +a denotes redness, -a indicates greenness when the values are negative; +b denotes yellowness when the values are positive and –b indicates blue when the values are negative respectively. The L, a and b values for the peach fruits were found as 46.25, 7.45 and 6.20, respectively. The findings of the chemical parameters analyzed for the peach fruits were moisture 87.55 per cent, total soluble solids (TSS) 13.43$^0$B, titratable acidity (as malic acid) 0.44 per cent with TSS/acid ratio of 29.86. Reducing sugars, total sugars, ascorbic acid and total carotenoids were 3.10 and 5.72 per cent, 45.69 mg/100 g and 23.54 µg/100g respectively. The suitability for canning and puree making from peach was clear from the findings of the analysis physico-chemical characterization of peach.

## 3.2 Characteristics of Canned Peach-Halves

The fruit halves of canned peach were stored for a period of 6 monts at ambient conditions and canned cut out analysis data are displayed in Table 2. The results presented show that the drained weights of the canned peach halves were significantly influenced by different treatment. The lowest drained weight of 54.77 per cent was observed in control. "The drained of all the treatments applied to the peach-halves were higher than that of controls which was 56.94, 57.13 and 58.10 per cent in peach halves canned in 30-40% concentration of juice percentage. Sugar reconstituted in apple juice concentrate medium and straight apple juice medium respectively has been reported" earlier by Vyas and Joshi [3]. The FPO specification [6] or the minimum drained weight are fulfilled in all the treatments shown in this paper. To meet the equilibrium process sugar diffusion takes place resulting in an increase in TSS during the storage period of 6 months in all the storage.

"The titratable acidity showed a declining trend with storage in all the treatments of peach-halves, as the acids might have been utilized in the hydrolysis of sucrose to simple sugars and also due to leaching into the covering medium with the advancement of storage time [7]. The acidity was comparatively higher in the control samples then the conventionally canned-peach halves which was 0.313 per cent of citric acid. This might be mainly due to the reason that 0.30 per cent of citric acid was added under the conventional method in the sucrose syrup of the canned peach-halves" [8]. The values for acidity was recorded highest (0.237) in treatment of covering media maintained at 40$^0$B with 40% peach juice and it was statistically at par with the treatment of covering media of 40$^0$B having 500 ppm maintained by 40 per cent peach juice. Ascorbic acid had the lowest value of 7.47 mg/100g in the treatment containing 30 per cent peach juice in a covering media of 40$^0$B.The retention of ascorbic acid in canned peach-halves showed a reduction in the vitamin C from the data and the retention of ascorbic acid was higher in vitamin C fortified treatments. This result was obviously due to the addition of ascorbic acid which not only increased the nutritive value of the canned product but also reduced non-enzymatic browning greatly. The highest (22.50 mg/100 g) and lowest levels (16.09 mg/100 g) of ascorbic acid in ascorbic acid fortified treatments in 40 per cent peach juice in a covering media of 40$^0$B having 500 ppm ascorbic acid and 30 per cent peach juice in a covering media of 40$^0$B having 500 ppm of ascorbic acid were observed, respectively. On

the other hand, in unfortified treatments the highest and the lowest levels of retained ascorbic acid were 8.92 and 7.47 mg/100 for both the treatments. The lowest level of the ascorbic acid at 4.27 mg/100 g was observed for control. Garg et al. [9] had observed in *Crawford Early* and *Golden Bush* cultivars of peaches that the ascorbic acid in canned peaches declined by 80.0-81.0 and 78.0-82.0 per cent, respectively.

"Non-enzymatic browning was recorded the highest in control samples. Canned peaches in control system recorded an optical density of 0.169 as compared to the samples packed in a medium containing fruit juice with ascorbic acid [10]. It was found much lower in the vitamin C fortified samples. It may be due to the antioxidant effect of the vitamin C. The highest and the lowest levels of optical density at 440 nm were 0.161 and 0.108, for the unfortified samples containing 30 per cent peach juice and 40 per cent peach juice in a covering media of $40^0$B, respectively. Whereas, in ascorbic acid fortified samples the highest and lowest levels of the optical density were 0.072 and 0.067 corresponding to treatments containing 30 and 40 per cent peach juice in a covering media of $40^0$B with 500 ppm ascorbic acid, respectively" [8].

The evaluation for Sensory quality of peach halves was carried out by a panel of 7 trained judges and they revealed that all the treatments showed an improvement over control samples. On the basis of different quality parameters, *viz,* colour, flavour, taste and texture, the treatment containing 40 per cent peach juice was rated as best over six months of storage period followed by samples containing 30 per cent peach juice, 40 per cent peach juice with 500 ppm ascorbic acid and 30 per cent peach juice with 500 ppm ascorbic acid all in a covering media of 40 $^0$B and recorded overall Hedonic rating of 6.11,5.65, 5.57 and 5.42, respectively, on the nine-point Hedonic scale (Table 2 ). Hulme [11] has reported that "addition of acid leads to a firmer and crispy texture of peaches". Conventionally canned peach halves have been reported to be acceptable up to 200 days by Kinge [12].

Puree which was prepared from the extracted and left over pulp by adding sugar, salt and without adding sugar was also evaluated by the panel of seven semi-trained judges and the results are given in Table 3. Overall acceptability score based on the observation for the different sensory attributes, *viz*, colour, flavour, taste and consistency/body showed that the puree which was prepared by adding sugar retained better quality, higher acceptability and could be stored for six months. The highest rating of 8.75 was recorded for the puree prepared by adding sugar, followed by those prepared with salt (8.0) and without adding sugar (7.5), respectively as per Hedonic and Bhowmik, Pan Method [13].

## 4. CONCLUSION

From the present study, it may be concluded that canning of peach fruits in natural fruit juice containing 40 per cent juice in a covering medium of $40^0$Brix was rated the best followed by 30 per cent peach juice on the basis of physico- chemical, sensory and microbiological evaluation. The additional advantage of canning of fruits in natural fruit juice occurred due to the economic use of the left over pulp for preparation of puree. Puree which was prepared by adding sugar retained better quality, higher acceptability and could be stored for 6 months [14]. Thus addition of juice not only improves the quality of canned product but also enhance its nutrition along with the economic utilization of the left over pulp in the form of puree.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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