The Pharma Innovation Journal 2018; 7(5): 402-406

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2018; 7(5): 402-406

www.thepharmajournal.com
Received: 19-03-2018
Accepted: 21-04-2018

Fatima Irfan
PG Student, Warner College of Dairy Technology, SHUATS, Naini, Allahabad, UP, India

AA Broadway
Associate Dean and Professor, Warner College of Dairy Technology, SHUATS, Naini, Allahabad, UP, India

SA Hossain
Associate Professor, Warner College of Dairy Technology, SHUATS, Naini, Allahabad, UP, India

Prachi Wasnik
PhD Research Scholar, Warner College of Dairy Technology, SHUATS, Naini, Allahabad, UP, India

Correspondence
Fatima Irfan
PG Student, Warner College of Dairy Technology, SHUATS, Naini, Allahabad, UP, India

Studies on the use of papaya and beetroot for the preparation of jam

Fatima Irfan, AA Broadway, SA Hossain and Prachi Wasnik

Abstract
The present study was undertaken with the objective of developing jam with enhanced nutritional properties and acceptable sensory attributes. The product was prepared by using *Carcica* papaya along with beetroot in the ratio of To (100:00), T_1 (95:5), T_2 (90:10), T_3 (85:15). Pectin was utilized. The jam thus prepared was analyzed for physico-chemical properties (β-carotene, ascorbic acid, acidity, reducing sugar, TSS, pH, ash, moisture, protien and TS) and were also evaluated sensorily on a 9-point Hedonic scale. The control (To) had highest β- carotene (192.94(µg) /100g), Acidity (0.66%), Ascorbic acid (60.64mg/100g), Moisture (30.45%), while T_3 had highest reading for Reducing sugar (22.28%), TSS (69.47 Brix), pH (3.52), Ash (0.97%), Protein (0.69%), TS (69.71%). The best combination tested sensorily was found to be T_1 (95:05) ratio of papaya and beetroot as this treatment was good and acceptable by the sensory panel

Keywords: Beetroot, *Carcica*, jam, papaya, pectin, sensory

1. Introduction
Jams are usually made from pulp and juice of fruit, combination of several fruits and the combination with vegetables. Berries and other small fruits are most frequently used, though larger fruits such as papaya, apricots, peaches, or plums cut into small pieces or crushed are also used for jams. The combination of high acidity (pH around 3.0) and high sugar content (68-72%) prevents mould growth after opening the jar. Good jam has a soft, even consistency without distinct pieces of fruit, a bright color, a good fruit flavor and a semi-jellied texture that is easy to spread but has no free liquid (Berolzheimer *et al*. 1959) [4]. Jam gel formation occurs only within a narrow range of pH values. Optimum pH conditions are found near 3.2 for gel formation. The optimum solids range is slightly above 65%. It is possible to have gel formation at 60% solids, by increasing the pectin and acid levels. The quantity of pectin required for gel formation is dependent upon the quality of pectin components (Copenhagen Pectin A/S 1993; Wasnik, 2016) [14]. Ordinarily, slightly less than 1% pectin is sufficient to produce a satisfactory structure (Desrosier and Desrosier, 1978) [5].
The manufacture of jams, jellies and preserves involves application of heat in order to obtain sugar equalization (homogenous distribution of the soluble ingredients between the individual fruit pieces and the surrounding gel); to preserve product by deactivating enzymes and killing yeast and moulds present in the raw material; to concentrate the product by evaporation of water and to de-aerate the product leading to better appearance (no air bubbles, deeper colour) and improved chemical stability (decreased oxidation of flavour and colour components).
In recent years increased attention has been focused on utilization of healthy foods which necessarily include fruits. The nutritional value of a fruit mainly depends on its variety, growing conditions and ripeness (Yamamoto, 1964) [15]. Papaya and beetroot are considered one of the highly nutritional varieties. Papaya or '*Carica papaya*' contains many biologically active compounds of which 'papain' is used to treat arthritis (Ayoola and Adeyeye, 2010) [3]. Significant amount of carotenoids is also present in papaya with provitamin 'A' activity (Yamamoto, 1964) [15]. Sankat & Maharaj (1997) [10] found that papaya is a good source of Ca++ and an excellent source of vitamins A, B1, B2 and vitamin C. Its protein content is approximately 5%.
The beetroot (*Beta vulgaris*) being an alkaline food with pH from 7.5 to 8.0 has been acclaimed for its health benefits, in particular for its disease fighting antioxidant potential, significant amount of vitamin C, B1, B2, B6, B12, niacin, while the leaves are an excellent source of vitamin A (Peter *et al*., 2011) [8]. It has also revealed significant tumor inhibitory effects in skin and lung cancer (Kapadia *et al*., 1996) [7].

There are various ways of consumption of papaya and beetroot and more mouth watering one is its utilization in preservatives like jam. The present study was undertaken to find the suitable combination of their pulp for the preparation of acceptable quality of jam.

2. Materials and methods

Papaya, beetroot and sugar was collected from local market of Allahabad whereas citric acid was obtained from the laboratory of food technology in Warner college of Dairy Technology, SHUATS. Papaya was used as the major ingredient for the jam preparation. Fresh ripe papaya and beetroot were washed thoroughly with running water to remove all the dirt. After removing the seeds, it was peeled followed by cutting in to small cubes with the help of sharp knife. Physico-chemical analysis of the final product was carried out where determination of Beta-carotene was done using standard methods described in Slovak (1986) [11]. Ascorbic acid, TSS, pH, protein, TS were analyzed using methods depicted in Ranganna (1986) [9]. Acidity and reducing sugar was calculated by A.O.A.C (2000) [2], whereas analysis of ash and moisture was carried out by A. O. A. C. (1975) [1] and ISI (1984) [6] methods respectively. Sensory analysis was done using 9 point Hedonic scale. The data was analyzed statically by using Analysis of variance at 5% level of significance.

2.1 Treatment Combinations

For developing jam, different combinations of papaya and beetroot were formulated for the treatments by using papaya and beetroot in ratios To (100:00), T_1 (95:5), T_2 (90:10), T_3 (85:15). All the treatments were admixed with 75% sucrose and were replicated five times.

2.2 Preparation of jam

Cubes of papaya and beetroot were boiled separately for about 10 minutes (with approximately 250 ml water per 100 gm papaya and beetroot each). After boiling, the mass was blended with the help of grinder. Blended pulp of papaya and beetroot was distributed into different ratio as per the treatments. The mixture of pulp was placed in the stainless steel pot with the help of ladle and then the required amount of sugar (@75%). pectin and citric acid (@0.5% each) was added to it. Small amount of water can be mixed if required. Papaya has a source of natural pectin. Addition of excess pectin results in harder jam and using more sugar can make it sticky. Sugar which binds to the water molecules frees up the pectin chains to form their gelling network. Mixture was heated and specified amount of citric acid was added while boiling itself.

The mixture was heated upto 105ºC (68-70% TSS) to ensure proper setting of jam. Stirring was done continuously and all the way to the bottom so as to avoid burning. Jam was heated with low flame till it reached to the end point (TSS 68%-70%). Drop test carried out to confirm the end of cooking where a little amount of jam was taken with spoon and dropped in to the beaker containing cold water. Conjugated drop was the indication that the jam was ready.

3. Results and discussion

The data collected on different aspects was tabulated and analyzed statistically using analysis of variance and critical difference. The significant and non-significant differences observed have been analyzed critically within the treatment combinations (Table 1 and Table 2).

3.1 Physico-chemical analysis (Table 1)

3.1.1 β –Carotene (µg)

Beta-carotene content was found to be greatest in treatment T_0 (control) (195.0 µg/100g). The selection of 100 percent papaya might be one of the contributing factors for higher beta-carotene content in control. In fruits the presence of vitamin A is in the form of carotenes (α, β and γ) which is converted into vitamin inside the body, its deficiency results in impairment of immune system, hematopoiesis and typical ocular effects (eg, xerophthalmia, night blindness (Umoh, 1998) [13]. The highest mean value obtained for beta carotene (µg/100gm) in treatment T_0 (192.94), followed by T_1 (187.26) and T_2 (183.04) and lowest for T_3 (166.52) which may be due to decreasing levels of papaya pulp from T_0 to T_3.

3.1.2 Ascorbic acid (mg)

The highest mean value obtained for ascorbic acid in treatment T_0 (60.64) followed by T_1 (57.05) and T_2 (49.38) and lowest T_3 (47.46). This may be attributed to the presence of higher amount of papaya pulp in treatment T_0 as papaya is a rich source of ascorbic acid (Umoh, 1998) [13].

3.1.3 Acidity (%)

The mean value recorded for % acidity in jam for controlled and experimental samples differed non significantly and noted to be T_0 (0.66), T_1 (0.62) and T_2 (0.58) and lowest T_3 (0.57). A decreasing trend of acidity was observed from T_0 to T_3 which may be on account of increasing beetroot pulp imparting more sweetness to the product.

3.1.4 Reducing Sugar (%)

The highest mean value obtained for reducing sugar in jam was recorded for treatment T_3 (22.28), followed by T_2 (22.80) and T_1 (21.58) and lowestT_0 (21.00) which may be because of increasing levels of beet root pulp from T_1 to T_3. Significant variations were observed among all the treatments.

3.1.5 TSS (°Bx)

The highest mean value obtained for TSS in jam was recorded for the treatment T_3 (69.47), followed by T_2 (69.21) and T_1 (68.67) and T_0 (68.60). Increasing levels of beetroot pulp from T_1 to T_3 may be held responsible for the same.

3.1.6 pH

Non significant differences were observed among all the treatment samples. Treatment T_3 recorded highest value for pH (3.52), followed by T_2 (3.47), T_1 (3.42), and lowest To (3.36). The results found are in the line with Srinu and Suseela (2016) [12] for amla and papaya jam.

3.1.7 Ash (%)

All the treatment samples showed non significant differences and recorded as T_3 (0.97), followed by T_2 (0.93) and T_1 (0.93) and lowest for T_0 (0.91). The results found are in the agreement with Srinu and Suseela (2016) [12] for amla and papaya jam. The decreasing trend from T_3 to T_0 may be because of decreasing amount of papaya pulp.

3.1.8 Moisture (%)

The highest mean value obtained for moisture % in jam was noted for treatment sample T_0 (30.45), followed by T_1 (30.38) and T_2 (30.28) and lowest for T_3 (30.28). This may be on

account of increasing total solids from T_0 to T_3. All the samples demonstrated non significant differences.

3.1.9 Protein (%)
The highest mean value of % protein in jam was recorded for T_3 (0.69), followed by T_2 (0.62) and T_1 (0.49) and T_0 (0.43). All the treatments were non significantly different from each other.

3.1.10 TS (%)
The mean values obtained for % Total Solids in the treatment samples of jam revealed non significant differences among each other. Highest value was recorded for T_3 (69.71), followed by T_2 (69.71) and T_1 (69.61) and T_0 (69.54).

3.2 Sensory analysis (Table 2)
3.2.1. Color and Appearance
Treatment T_0 received highest mean value score for color and appearance. Significant differences were observed among all the experimental samples T_1 (7.60) and T_2 (7.40) and T_3 (7.20).

3.2.2 Texture and Consistency
The highest mean value of scores obtained for texture and consistency in controlled and experimental samples of jam differed significantly and were noted as T_1 (8.60), followed by T_0 (7.20) and T_2 (7.20) and lowest T_3 (7.00).

3.2.3 Taste and flavor
Significant differences were observed for the samples T_1, T_0 and T_2. Highest score was noted 8.00 for T1, followed by 7.60 for T_0. Similar scores were achieved by samples T_2 (7.00) and T_3 (7.00).

3.2.4 Overall Acceptability
Treatment T_1 received highest scores for overall acceptability (8.40), followed by T_0 (7.60) T_2 (7.60) and T_3 (7.00).

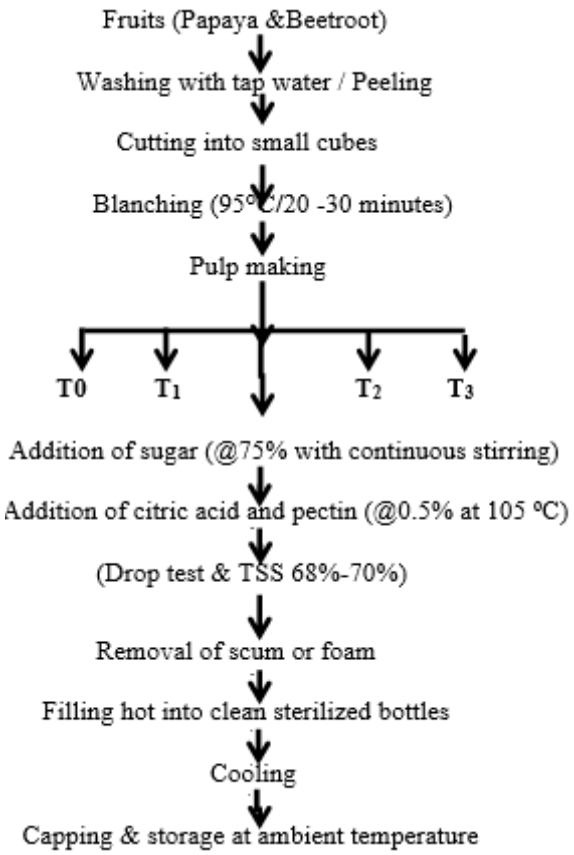

Fig 1: Flow chart for jam preparation

Table 1: Physico-chemical analysis of Jam samples

Parameter	T_0	T_1	T_2	T_3
β-Carotene (µg)/100gm	192.94±1.43^a	187.26±0.46^b	183.04±2.16^b	166.52±0.68^c
Ascorbic acid (mg)/100gm	60.64± 0.73^a	57.05±0.73^b	47.46±0.49^c	49.38±0.93^d
Acidity %	0.66±0.02^a	0.62±0.02^a	0.58±0.02^a	0.57±0.01^a
Ash %	0.91±0.01^a	0.93±0.03^a	0.93±0.03^a	0.97±0.03^a
Reducing sugar %	21.00±0.51^a	21.31±0.08^{ab}	21.86±0.06^b	20.72±0.22^{bc}
TSS (°Bx)	68.60±0.02^a	68.67±0.05^a	69.21±0.23^{bc}	69.27±0.35^c
pH	3.36±0.03^a	3.42±0.12^a	3.47±0.05^a	3.52±0.10^a
Moisture %	30.34±0.19^a	30.28±0.31^a	30.28±0.13^a	30.45±0.21^a
Protien %	0.43±0.01^a	0.49±0.01^a	0.62±0.02^a	0.69±0.02^a
Total Solids (TS) %	69.54±0.19^a	69.61±0.31^a	69.71±0.13^a	69.71±0.21^a

Average of five replications expressed as mean ± SD
Mean values with different superscripts within a row differ significantly ($p < 0.05$)

Table 2: Sensory Scores (9 Point Hedonic Scale)

Parameters	T_0	T_1	T_2	T_3
Colour & appearance	7.60±0.24[a]	8.06±0.24[b]	7.40±0.24[ac]	7.20±0.28[ac]
Texture & Consistency	7.20±0.19[a]	8.60±0.24[b]	7.20±0.19[a]	7.00±0.24[a]
Taste and Flavor	7.60±0.24[a]	8.00±0.31[ab]	7.00±0.32[ac]	7.00±0.31[ac]
Overall acceptability	7.60±0.39[a]	8.40±0.24[a]	7.60±0.24[a]	7.00±0.31[a]

Average of five replications expressed as mean ± SD

Mean values with different superscripts within a row differ significantly ($p < 0.05$).

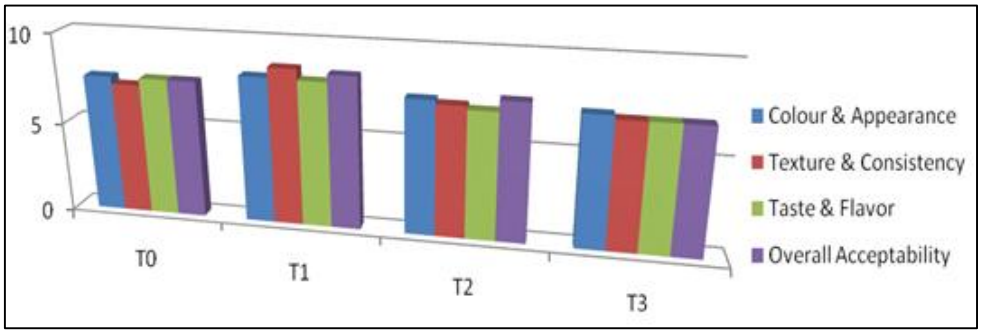

Fig 2: Effect of different combinations of papaya and beetroot on sensory evaluation.

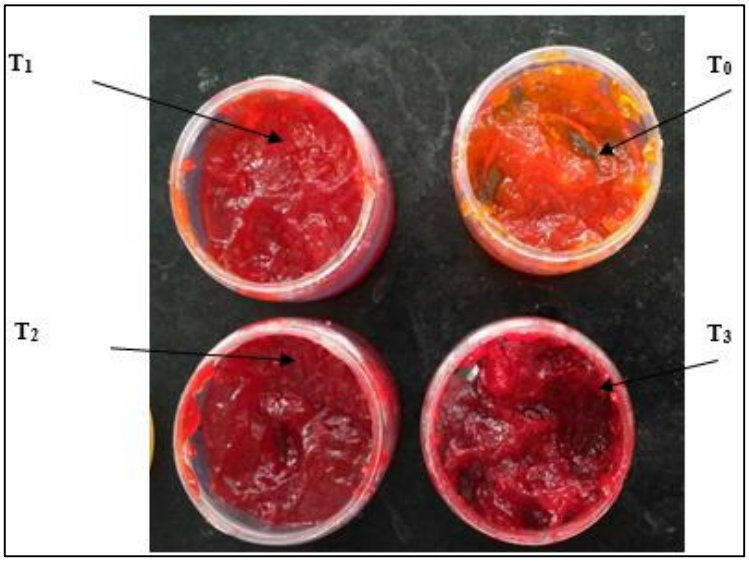

Fig 3: Effect of combination of pulps on intensity of color.

4. Conclusion

The present study was conducted using papaya and beetroot pulp in three different ratio T_0 (100:00), T_1 (95:05), T_2 (90:10), T_3 (85:15). The physico-chemical properties and sensory attributes were evaluated. And it was revealed that papaya and beetroot pulp in combinations are suitable for preparation of jam of acceptable quality. Treatment T_1 received highest scores (8.40±0.24) for the overall acceptability of the product. Thus it can be concluded that the combinations of papaya and beetroot pulp in the ratio (90:10) can be successfully used for the preparation of more acceptable quality of jam.

5. References

1. AOAC. Official method 942.15 Acidity (Titratable) of fruit products with AOAC official method 920.7th Edition, Washington, DC, 1975.
2. AOAC. Official method 942.15 Acidity (Titratable) of fruit products with AOAC official method 920.17th Edition, Washington, DC, 2000.
3. Ayoola PB, Adeyeye A. Phytochemical and nutrient evaluation of *Carica papaya* (pawpaw) leaves. International Journal of Recent Research and Applied Science. 2010; 5(3):345.
4. Berolzheimer R, Bentley M, Flora R. *The American Woman's Cook Book*. Consolidated Book Publishers, Inc, Cornell University Press. 1959, 10-22.
5. Desrosier NW, Desrosier JN. The technology of food preservation. Fourth edition. AVI publishing Co. Inc. Westport, Connecticut. during storage. Beverage and food World. 1978; 32(11):72-75.
6. ISI Handbook of Food Analysis, Part 2,3,4, And Honey; Edible Starches And Starch Products And Foodgrains And Foodgrain Products, 1984.
7. Kapadia G, Tokuda H, Harukuni K, Takao M, Nishino H. Chemoprevention of lung and skin cancer by Beta vulgaris (beet) root extract. Cancer Letter. 1996; 100:211-214.
8. Peter C, Wootton B, Ryan L. A beetroot juice shot is a significant and convenient source of bioaccessible antioxidants. Journal of functional food. 2011; 3:329-334.
9. Ranganna. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. 2nd ed. Tata McGraw Hill Publishing Company Ltd., New Delhi, India, 1986, 12.

10. Sankat CK, Maharaj R. Papaya: Postharvest physicology and storage of tropical and subtropical fruits. Wallingford, UK: CAB International, 1997.
11. Slovak. Determination of carotenes (A provitamins). ÚNN, 1986, 5.
12. Srinu D, Suseela K. Proximate and mineral composition of amla-papaya jam incorporated with honey. International Journal of Agricultural Science and Research. 2016; 6(6):317-328.
13. Umoh IB. Commonly Used Fruits in Nigeria. In Osagie, A.U. and Eka, O.U., Eds., Nutritional Quality of Plant Foods, Post Harvest Research Unit, University of Benin, Benin City. 1998, 221-244.
14. Wasnik PK. A study on physico-chemical and microbial quality of pectin paneer whey jelly. The Bioscan. 2016; 34(2):283-287.
15. Yamamoto HY. Comparison of carotenoids in yellow and red-fleshed Carica papaya. Nature. 1964; 201:1049-1050.