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Standardization of blended fruit leather of mango (*Mangifera indica* Linn.) and papaya (*Carica papaya* L.)

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Abstract

The study was conducted to Standardization of blended fruit leather of mango (*Mangifera indica* linn.) and papaya (*Carica papaya*. L). In Post-Harvest Laboratory of Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad. For preparation of fruit leather, additives like sugar and butter were added to the pulp in different proportions and the mixture dried in mechanical dehydrator. Dried fruit leather sheets were cut into rectangular shapes (2.5 × 2.5 cm²) using a stainless steel knife and wrapped in polythene sheet. Best recipe was selected on the basis of sensory evaluation. For storage, Mango and Papaya fruit bar was packed in aluminium laminated pouches and polyethylene pouches, kept for 3 months and analyzed periodically for changes in quality. Results of the sensory evaluation indicate that a very good quality fruit bar can be prepared, T₇ (75% mango+ 25% papaya with 200g sugar). Butter and drying the mixture in a mechanical dehydrator at 55 ± 2 °C for 6 h. During 5 months of storage, there was about 3-5% moisture gain, 6.00 and 9.35% loss in total sugars and butter respectively, along with slight losses in titratable acidity and sensory quality. The changes in chemical and sensory quality attributes were minimum in Mixed Fruit Leather (Mango and Papaya), packed in aluminium laminated pouches as compared to those packed in polyethylene pouches, and the product stored under well ventilated room than that under normal temperature. Further, the products were stable up to 3 months during storage under ambient condition.

Keywords: Mango, papaya, leather, fruit bar, TSS

Introduction

Mango (*Mangifera indica* Linn.) is known as 'The King of Fruits' due to its exotic flavor, delicious taste and several other desirable characters. Mango, the national fruit of India is the most popular tropical fruit crop belongs to Anacardiaceae family originated from south west Asia (indo-burma region). It has intimate association with cultural, religious, aesthetic and economic life of Indians). India is the largest producer of mango accounting for about 54% of the world production. Total area (in 000ha) is 2516.00, percentage of total fruit area is 34.7, production (000ha) is 18431.3, percentage of total fruit production is 20.7 and productivity (in t/ha) is 7.3 (NHB 2016).

Papaya (*Carica papaya* L.) is an important fruits of tropical and subtropical regions of the world belongs to family Caricaceae and also known as papita, pawpaw, and true melon. It is native to Tropical America. In India, it was introduced in 16th century via Malacca and now become wide spread throughout the country. India is top most papaya producing country growing in area of about 133.4 thousand ha with production of 5639.3 thousand mt and average productivity 42.3 mt per ha (NHB, 2013-14).

Materials and Methods

Experimental detail

| | |
|-------------------------|---|
| Processed product | : Mixed fruit leather (Mango and Papaya) |
| Crop | : Mango (<i>Mangifera indica</i> Linn.) : Papaya (<i>Carica papaya</i> . L) |
| Design | : simple completely randomized design |
| Treatment | : Factor A – 3 levels of fruit pulp ratio : Factor B – 3 levels of sugar concentration |
| Total No. of treatments | : 10 |
| No. of replications | : 3 |

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Treatment details

The experiment comprised of 10 treatment combinations of 3 levels of fruit pulp ratio and 3 levels of sugar concentration as follow:

Process

- Extraction of mango and papaya pulp
- Processing mango and papaya pulp
- Preparation of mango-leather

Table 1: The factor of pulp and sugar

| Notation | Treatments |
|----------------|--|
| | Factor A (Pulp Ratio) and Factor B (Sugar Ratio) |
| T ₀ | control |
| T ₁ | 75% Mango + 25% Papaya +100gm sugar |
| T ₂ | 50% Mango + 50% Papaya+100gm sugar |
| T ₃ | 25% Mango + 75% Papaya+100gm sugar |
| T ₄ | 75% Mango + 25% Papaya +150gm sugar |
| T ₅ | 50% Mango + 50% Papaya+150gm sugar |
| T ₆ | 25% Mango + 75% Papaya+150gm sugar |
| T ₇ | 75% Mango + 25% Papaya +200gm sugar |
| T ₈ | 50% Mango + 50% Papaya+200gm sugar |
| T ₉ | 25% Mango + 75% Papaya+200gm sugar |

Table 2: Details of treatment combinations

| Notation | Treatment | Mango pulp (gm) | Papaya pulp (gm) | Sugar (gm/100 gm of pulp) |
|----------------|-------------------------------|-----------------|------------------|---------------------------|
| T ₀ | P ₀ S ₀ | 500 | 500 | 100 |
| T ₁ | P ₁ S ₁ | 750 | 250 | 100 |
| T ₂ | P ₂ S ₂ | 500 | 500 | 100 |
| T ₃ | P ₃ S ₃ | 250 | 750 | 100 |
| T ₄ | P ₄ S ₄ | 750 | 250 | 150 |
| T ₅ | P ₅ S ₅ | 500 | 500 | 150 |
| T ₆ | P ₆ S ₆ | 250 | 750 | 150 |
| T ₇ | P ₇ S ₇ | 750 | 250 | 200 |
| T ₈ | P ₈ S ₈ | 500 | 500 | 200 |
| T ₉ | P ₉ S ₉ | 250 | 750 | 200 |

Results and Discussion

- The present investigation entitled “Standardization of Mango (*Mangifera indica* Linn.) and Papaya (*Carica papaya*. L) Fruit leather” was carried out in the

horticulture post-harvest laboratory in the department of Horticulture, SHUATS during 2017-2018.

- The main objectives of the present investigation were to standardize the blend ratio of mango and papaya pulp for preparation of better quality mixed fruit leather and to find out its acceptability during storage.
- The investigation was carried out with ten (10) treatments combinations consisting of three (3) different ratio of mango and papaya pulp (P₁, P₂, and P₃) with three (3) different ratio of sugar S₁, S₂, and S₃ replicated three times in a simple completely randomized design (simple CRD). The mixed fruit leather was prepared as per the treatment combination and stored at room temperature for 100 days.
- The organoleptic parameters based on colour, flavour, texture, taste and overall acceptability of mixed fruit leather was evaluated by panel of 10 judges on a 9 point Hedonic scale. The marks were given in the scale of 1 to 9 ranging from extremely dislike to extremely liked. The chemical parameters (TSS and pH) were also evaluated from initial (0) day of storage up to 100days.
- The TSS content of mixed fruit leather was estimated by hand refractometer, the pH was measured using an elementary pH meter, and the percent titrable acidity was estimated by simple acid / alkaline titration method as described in A.O.C.C(1984). The data were analyzed statistically and reported at 5% level of significance. The prepared mixed fruit leather was stored up to 100 days at room temperature to study the physico - chemical character during storage. It was noted that pulp ratio T₇ (75% Mango + 25% Papaya) was found the best based on overall acceptability.
- The colour rating was found maximum in T₉ (25% Mango+ 75% Papaya) and for flavour T₇ (75% mango + 25% papaya) and texture fruit pulp ratio T₁ (75% mango + 25% papaya) while for taste T₈ (50% mango+50% papaya) was found the best.
- The organoleptic rating of mixed fruit leather showed the different trend on increasing the quantity of sugar in the ratio of fruit pulp. It was found that the values for flavour decrease while for colour, texture and overall acceptability increase with increase in sugar content.

Table 3: Effect of different recipes on colour, flavour, and texture of blended fruit leather during storage

| Treatments No. | Treatments combination | Colour (mango and papaya leather) | | | | | | Flavour (mango and papaya leather) | | | | | | Texture (mango and papaya leather) | | | | | |
|----------------|-------------------------------------|-----------------------------------|---------|---------|---------|---------|----------|------------------------------------|---------|---------|---------|---------|----------|------------------------------------|---------|---------|---------|---------|----------|
| | | Initial | 20 Days | 40 Days | 60 Days | 80 Days | 100 Days | Initial | 20 Days | 40 Days | 60 Days | 80 Days | 100 Days | Initial | 20 Days | 40 Days | 60 Days | 80 Days | 100 Days |
| T ₀ | control | 8.000 | 7.867 | 7.667 | 7.600 | 7.600 | 7.533 | 7.633 | 7.700 | 7.700 | 7.667 | 7.567 | 7.400 | 8.100 | 7.867 | 7.733 | 7.700 | 7.367 | 7.233 |
| T ₁ | 75% Mango + 25% Papaya +100gm sugar | 7.800 | 7.600 | 7.300 | 6.901 | 6.76 | 6.530 | 8.067 | 8.090 | 7.960 | 7.733 | 7.467 | 7.600 | 8.967 | 8.533 | 8.300 | 7.800 | 7.700 | 7.467 |
| T ₂ | 50% Mango + 50% Papaya+100gm sugar | 7.817 | 7.800 | 7.533 | 7.200 | 6.900 | 6.900 | 7.947 | 7.867 | 7.600 | 7.500 | 7.533 | 7.300 | 8.700 | 8.400 | 8.133 | 7.500 | 7.400 | 7.200 |
| T ₃ | 25% Mango + 75% Papaya+100gm sugar | 8.000 | 7.827 | 7.333 | 7.217 | 6.897 | 6.850 | 7.700 | 7.400 | 7.400 | 7.533 | 7.367 | 7.300 | 8.400 | 8.200 | 7.900 | 7.400 | 7.300 | 7.300 |
| T ₄ | 75% Mango + 25% Papaya +150gm sugar | 8.200 | 8.037 | 7.667 | 7.500 | 7.000 | 6.933 | 8.200 | 8.100 | 8.133 | 7.917 | 7.900 | 7.767 | 8.433 | 8.467 | 8.100 | 7.900 | 30.267 | 7.300 |
| T ₅ | 50% Mango + 50% Papaya+150gm sugar | 8.103 | 8.073 | 7.800 | 7.300 | 7.200 | 7.117 | 8.050 | 8.100 | 7.867 | 7.800 | 7.700 | 7.567 | 8.300 | 8.300 | 7.867 | 7.700 | 7.400 | 7.363 |
| T ₆ | 25% Mango + 75% Papaya+150gm sugar | 8.200 | 8.060 | 7.667 | 7.600 | 7.333 | 7.103 | 7.800 | 7.863 | 7.633 | 7.533 | 7.567 | 7.533 | 8.200 | 8.233 | 7.800 | 7.500 | 7.233 | 7.133 |
| T ₇ | 75% Mango + 25% Papaya+200gm sugar | 8.307 | 8.023 | 7.533 | 7.100 | 7.350 | 7.293 | 8.600 | 8.400 | 8.233 | 8.083 | 7.900 | 7.900 | 8.500 | 8.500 | 8.100 | 8.000 | 7.600 | 7.367 |
| T ₈ | 50% Mango + 50% Papaya+200gm sugar | 8.300 | 8.300 | 8.020 | 7.733 | 7.800 | 7.500 | 8.367 | 8.300 | 8.300 | 7.900 | 8.000 | 7.667 | 8.300 | 8.067 | 7.830 | 7.667 | 7.600 | 7.300 |
| T ₉ | 25% Mango + 75% Papaya+200gm sugar | 8.500 | 8.267 | 8.070 | 7.70 | 7.660 | 7.533 | 8.200 | 8.233 | 7.900 | 7.733 | 7.700 | 7.667 | 7.900 | 7.667 | 7.500 | 7.633 | 7.000 | 6.700 |
| | F-test | S | S | S | NS | S | S | S | S | NS | S | S | S | S | S | S | NS | NS | NS |
| | S.Ed± | 0.091 | 0.081 | 0.127 | 0.103 | 0.095 | 0.097 | 0.097 | 0.075 | 1.968 | 2.359 | 0.128 | 0.131 | 0.131 | 1.761 | 0.094 | 1.465 | 1.227 | 1.706 |
| | C.D. at 5% | 0.191 | 0.169 | 0.266 | 0.21 | 0.200 | 0.204 | 0.204 | 0.158 | 0.266 | 0.313 | 0.269 | 0.275 | 0.275 | 0.249 | 0.198 | 0.193 | N/A | 0.212 |

Table 4: Effect of different recipes on taste, overall acceptability, and T.S.S. of blended fruit leather during storage

| Treatments No. | Treatments combination | Taste (mango and papaya leather) | | | | | | Overall acceptability (mango and papaya leather) | | | | | | T.S.S (mango and papaya leather) | | | | | |
|----------------|-------------------------------------|----------------------------------|---------|---------|---------|---------|----------|--|---------|---------|---------|---------|----------|----------------------------------|---------|---------|---------|---------|----------|
| | | Initial | 20 Days | 40 Days | 60 Days | 80 Days | 100 Days | Initial | 20 Days | 40 Days | 60 Days | 80 Days | 100 Days | Initial | 20 Days | 40 Days | 60 Days | 80 Days | 100 Days |
| T ₀ | control | 7.700 | 7.800 | 7.700 | 7.633 | 7.400 | 7.333 | 7.767 | 7.750 | 7.600 | 7.500 | 7.400 | 7.400 | 27.167 | 31.500 | 31.853 | 28.333 | 28.333 | 30.967 |
| T ₁ | 75% Mango + 25% Papaya +100gm sugar | 8.000 | 7.850 | 7.800 | 7.900 | 7.567 | 7.633 | 8.300 | 8.200 | 8.030 | 7.800 | 7.700 | 7.600 | 31.300 | 29.500 | 31.500 | 32.167 | 32.000 | 33.367 |
| T ₂ | 50% Mango + 50% Papaya+100gm sugar | 8.200 | 8.000 | 8.033 | 7.800 | 7.850 | 7.500 | 7.400 | 7.300 | 7.300 | 7.150 | 7.133 | 6.900 | 30.867 | 30.633 | 31.967 | 31.333 | 32.583 | 32.567 |
| T ₃ | 25% Mango + 75% Papaya+100gm sugar | 8.200 | 7.878 | 7.900 | 5.400 | 7.583 | 7.400 | 7.213 | 7.100 | 7.000 | 6.800 | 6.533 | 6.500 | 30.033 | 31.217 | 31.520 | 30.823 | 31.500 | 32.243 |
| T ₄ | 75% Mango + 25% Papaya +150gm sugar | 8.300 | 8.177 | 8.123 | 8.150 | 8.000 | 7.947 | 8.200 | 8.150 | 7.967 | 7.767 | 7.800 | 7.600 | 38.633 | 37.000 | 37.290 | 38.200 | 39.693 | 39.557 |
| T ₅ | 50% Mango + 50% Papaya+150gm sugar | 8.250 | 8.233 | 8.150 | 8.193 | 8.080 | 8.073 | 8.077 | 8.060 | 7.900 | 7.933 | 7.850 | 7.667 | 38.000 | 37.670 | 37.723 | 38.410 | 39.500 | 40.133 |
| T ₆ | 25% Mango + 75% Papaya+150gm sugar | 8.067 | 8.150 | 8.030 | 8.083 | 7.883 | 7.917 | 7.767 | 7.600 | 7.400 | 7.300 | 7.100 | 6.900 | 37.100 | 37.500 | 37.500 | 38.193 | 39.467 | 40.247 |
| T ₇ | 75% Mango + 25% Papaya +200gm sugar | 8.333 | 8.317 | 8.300 | 8.100 | 8.100 | 7.900 | 8.600 | 8.500 | 8.100 | 8.150 | 8.050 | 7.900 | 41.677 | 42.000 | 42.800 | 42.457 | 44.427 | 44.400 |
| T ₈ | 50% Mango + 50% Papaya+200gm sugar | 8.480 | 8.450 | 8.400 | 8.360 | 8.180 | 8.200 | 8.150 | 8.100 | 7.900 | 7.733 | 7.883 | 7.880 | 42.433 | 51.833 | 41.800 | 43.590 | 43.847 | 43.367 |
| T ₉ | 25% Mango + 75% Papaya+200gm sugar | 8.100 | 8.213 | 8.100 | 8.133 | 8.150 | 8.090 | 7.800 | 7.567 | 7.467 | 7.133 | 7.100 | 6.800 | 40.583 | 51.567 | 42.843 | 43.543 | 42.523 | 43.333 |
| | F-test | NS | S | S | NS | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| | S.Ed± | 0.096 | 0.082 | 0.066 | 1.031 | 0.073 | 0.104 | 0.082 | 0.077 | 0.088 | 0.089 | 0.090 | 0.082 | 2.160 | 0.603 | 2.013 | 2.397 | 0.573 | 0.502 |
| | C.D. at 5% | 0.202 | 0.172 | 0.138 | N/A | 0.154 | 0.219 | 0.172 | 0.161 | 0.167 | 0.187 | 0.190 | 0.172 | 1.325 | 1.267 | 1.266 | 1.509 | 1.205 | 1.054 |

Table 5: Effect of different recipes on Acidity and pH of blended fruit leather during storage

| Treatments No. | Treatments combination | Acidity (mango and papaya leather) | | | | | | pH (mango and papaya leather) | | | | | |
|----------------|-------------------------------------|------------------------------------|---------|---------|---------|---------|----------|-------------------------------|---------|---------|---------|---------|----------|
| | | Initial | 20 Days | 40 Days | 60 Days | 80 Days | 100 Days | Initial | 20 Days | 40 Days | 60 Days | 80 Days | 100 Days |
| T ₀ | control | 0.733 | 0.75 | 0.72 | 0.78 | 0.703 | 0.692 | 4.400 | 4.300 | 4.260 | 4.170 | 4.000 | 4.047 |
| T ₁ | 75% Mango + 25% Papaya +100gm sugar | 0.75 | 0.94 | 0.947 | 0.96 | 0.983 | 1.01 | 5.083 | 5.133 | 4.783 | 4.600 | 4.583 | 4.467 |
| T ₂ | 50% Mango + 50% Papaya+100gm sugar | 0.74 | 0.907 | 0.933 | 0.923 | 0.967 | 0.96 | 5.217 | 5.197 | 5.127 | 4.887 | 4.600 | 4.633 |
| T ₃ | 25% Mango + 75% Papaya+100gm sugar | 0.77 | 0.86 | 0.85 | 0.85 | 0.86 | 0.82 | 5.350 | 5.250 | 5.323 | 5.100 | 5.200 | 4.600 |
| T ₄ | 75% Mango + 25% Papaya +150gm sugar | 0.77 | 0.923 | 0.953 | 0.947 | 0.96 | 0.967 | 5.110 | 5.000 | 4.900 | 4.567 | 4.400 | 4.467 |
| T ₅ | 50% Mango + 50% Papaya+150gm sugar | 0.78 | 0.81 | 0.84 | 0.82 | 0.887 | 0.883 | 5.177 | 3.400 | 4.633 | 4.300 | 4.133 | 4.567 |
| T ₆ | 25% Mango + 75% Papaya+150gm sugar | 0.78 | 0.79 | 0.82 | 0.8 | 0.84 | 0.893 | 4.900 | 4.300 | 4.400 | 4.200 | 4.000 | 4.000 |
| T ₇ | 75% Mango + 25% Papaya +200gm sugar | 0.803 | 0.887 | 0.903 | 0.9 | 0.92 | 0.96 | 4.800 | 4.467 | 4.500 | 4.300 | 4.167 | 4.233 |
| T ₈ | 50% Mango + 50% Papaya+200gm sugar | 0.805 | 0.7 | 0.72 | 0.717 | 0.737 | 0.74 | 4.700 | 4.600 | 4.300 | 4.055 | 4.050 | 4.060 |
| T ₉ | 25% Mango + 75% Papaya+200gm sugar | 0.81 | 0.66 | 0.687 | 0.643 | 0.67 | 0.673 | 4.583 | 4.567 | 4.600 | 4.400 | 4.633 | 4.367 |
| | F-test | S | S | NS | S | S | S | S | NS | S | S | S | NS |
| | S.Ed± | 0.019 | 0.068 | 0.032 | 0.07 | 0.042 | 0.04 | 0.113 | 0.573 | 0.091 | 0.091 | 0.121 | 0.159 |
| | C.D. at 5% | 0.009 | 0.032 | 0.015 | 0.03 | 0.02 | 0.019 | 0.237 | N/A | 0.191 | 0.192 | 0.253 | 0.333 |

Conclusion

The mixing of mango and papaya pulp in ratio of T₇ (75%Mango pulp + 25%Papaya pulp) with (200gm sugar) was found the best during storage period of 100 days. Hence, it is clear that both the fruits are suitable for the preparation of mixed fruit leather with good quality and high nutritive value. The cost involved was also very low. So, this recipe can be recommended for making of quality guava and papaya mixed fruit leather.

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