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## Preparation of mandarin blended passion fruit syrup

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### Abstract

An experiment entitled “Evaluation of passion fruit genotypes for preparation of blended syrup” was carried out during the year 2024-2025 at Post Harvest Technology Laboratory, Section of Horticulture, College of Agriculture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola with the objectives to evaluate the genotypes of passion fruit for preparation of mandarin blended passion fruit syrup, to study the effect of different proportions of mandarin-passion fruit juice blending for preparation of syrup, to assess the chemical changes of mandarin-passion fruit blended syrup during storage and to find out suitable recipe for preparation of mandarin-passion fruit blended syrup.

The experiment was laid out in Factorial Completely Randomized Design (FCRD) with two factor, as Factor ‘A’ Passion Fruit Genotypes (Two) G<sub>1</sub> - Purple genotype and G<sub>2</sub> - Yellow genotype and Factor ‘B’ Blending recipe (Six) viz., B<sub>1</sub> (100% Passion fruit Juice), B<sub>2</sub> (90% Passion fruit juice + 10% Mandarin juice), B<sub>3</sub> (80% Passion Fruit juice + 20% Mandarin juice), B<sub>4</sub> (70% Passion fruit juice + 30% Mandarin juice), B<sub>5</sub> (60% Passion fruit juice + 40% Mandarin juice) and B<sub>6</sub> (50% Passion fruit juice + 50% Mandarin juice) with twelve treatment combinations i.e. G<sub>1</sub>B<sub>1</sub>, G<sub>1</sub>B<sub>2</sub>, G<sub>1</sub>B<sub>3</sub>, G<sub>1</sub>B<sub>4</sub>, G<sub>1</sub>B<sub>5</sub>, G<sub>1</sub>B<sub>6</sub>, G<sub>2</sub>B<sub>1</sub>, G<sub>2</sub>B<sub>2</sub>, G<sub>2</sub>B<sub>3</sub>, G<sub>2</sub>B<sub>4</sub>, G<sub>2</sub>B<sub>5</sub>, G<sub>2</sub>B<sub>6</sub> and four replication. The observations in respect of chemical and sensory evaluation were recorded from fresh syrup and after 2, 3, 4 and 5 months of storage.

From the findings it was observed that, the G<sub>1</sub>B<sub>1</sub> i.e. (Purple rind with 100% Passion fruit juice) was found significantly superior for fresh, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> month of storage also they were found significantly superior for total soluble solids, pH, total sugars, reducing sugars, non - reducing sugars, titratable acidity, ascorbic acid, phenols and content.

Further, the taste, aroma, colour, appearance, astringency and overall acceptability score were increased continuously during maturation with advancement of time. The treatment combination G<sub>1</sub>B<sub>1</sub> i.e. (Purple rind with 100% Passion fruit juice), was found significantly superior for mandarin blended passion fruit syrup preparation.

**Keywords:** Passion fruit, mandarin, syrup, blended syrup, pulp, juices, recipes, evaluation, storage, TSS, PH, Titratable acidity, ascorbic acid, blending proportion, ratio, passion fruit vine, sugar, bottles, packaging, preservatives, water, sugar syrup, sodium benzoate, mixing, capping, labelling, genotypes

### Introduction

Passion fruit (Passifloraceae) is a woody, perennial vine that bears delicious fruits and occurs in purple (*Passiflora edulis Sims*) and yellow (*Passiflora edulis flavicarpa*) forms. The purple passion fruit is native from southern Brazil through Paraguay to northern Argentina. It has been stated that the yellow fruit is of unknown origin, or perhaps native to Amazon region of Brazil, or is a hybrid between *Passiflora edulis* and *Passiflora ligularis*. In India, passion fruit cultivation is confined to Kerala, Tamil Nadu, Karnataka and north-eastern states. India has enjoyed a moderate harvest of purple passion fruit in the Nilgiris, Wayanad, Kodaikanal, Shevroys, Coorg and Malabar in the south. The yellow form was unknown in India until just a few decades ago when it was introduced from Sri Lanka and proved well adapted to low elevations around Chennai and Kerala.

Passion fruit is a high acid food due to the predominance of two acids, citric and malic acid. Passion fruit also contains considerable amount of sugar. Both the yellow and purple passion fruits contain ascorbic acid. Ascorbic acid is an organic acid with good antioxidant properties and is a good source of Vitamin C. Passion fruit is high in potassium, vitamin A, vitamin C, niacin and fibre and it is low in sodium, cholesterol and saturated fats and also fruit juice has a wonderful aroma and flavour which has higher acid content. ([prsvkm.kau.in](http://prsvkm.kau.in)).

Passion fruit is mainly used in jams, jellies and fruit juices (Joy, 2010). Passion fruit juice can be boiled down to a syrup which is used in making sauce, gelatine desserts, candy, ice cream, sherbet, cake icing, cake filling, meringue or chiffon pie, cold fruit soup or in cocktails (Morton, 1987)<sup>[17]</sup>.

Passion fruit is used for medicinal purposes as a sedative, as well as a food source. It is used for mood disorders (depression, anxiety, stress); insomnia and sleep disorders, headaches, migraines and general pain, stomach problems and to relieve menstrual cramps and premenstrual syndrome. Passion fruits have anti-inflammatory, cough suppressant, hypotensive properties. It may have promising and powerful effect on neurological disorders and chronic diseases such as heart disease and cancer (Joy, 2010). Passion fruit especially yellow type contains lot of antioxidants thus improving body's immunity, particularly against the new generation fevers and other diseases including cancer (Varghese *et al.*, 2015)<sup>[33]</sup>.

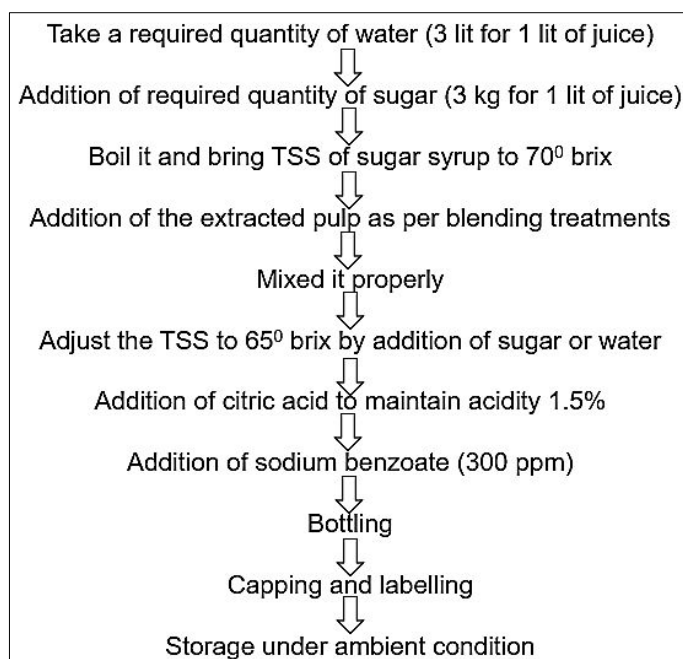
### Materials and Methods

Fully matured and physiologically ripe passion fruits (*Passiflora edulis*) and Nagpur mandarins (*Citrus reticulata*) were procured from local orchards in Akola and Buldhana

districts. Yellow rind genotypes were collected from Panaj (Farmer: Prabhakar Tade) and Jalgaon Jamod (Farmer: Eknath Aage), while the purple rind genotype was also obtained from Jalgaon Jamod. The fresh fruits were brought to the Post-Harvest Technology Laboratory for analysis.

Laboratory experiment was conducted in the Horticulture Section, College of Agriculture, Akola, during 2024-25, using Factorial Completely Randomized Design (FCRD) with two factors: Factor A - Passion fruit genotypes (Yellow and Purple rind) and Factor B - Blending recipes (six combinations) i.e. B<sub>1</sub> (100% Passion fruit Juice), B<sub>2</sub> (90% Passion fruit juice + 10% Mandarin juice), B<sub>3</sub> (80% Passion Fruit juice + 20% Mandarin juice), B<sub>4</sub> (70% Passion fruit juice + 30% Mandarin juice), B<sub>5</sub> (60% Passion fruit juice + 40% Mandarin juice) and B<sub>6</sub> (50% Passion fruit juice + 50% Mandarin juice), resulting in twelve treatments. Each treatment was replicated four times. Six bottles were prepared per treatment. Observations were recorded on various physico-chemical parameters during storage to evaluate the suitability of passion fruit genotypes for blended syrup preparation<sup>[28]</sup>.

### Flow Sheet for the Preparation of Mandarin-Passion Fruit Blended Syrup



### Results and Discussion

Data in respect of TSS, pH, titratable acidity and ascorbic acid content due to the effect of different passion fruit genotypes and recipes is presented in table 1 and their interaction were recorded at fresh and 150<sup>th</sup> days of storage of mandarin blended passion fruit syrup is shown in Table 2.

#### Results

##### 1. Effect of different passion fruit genotypes on pH, TSS, titratable acidity and ascorbic acid content of mandarin blended passion fruit syrup

In fresh and 150 days stored mandarin blended passion fruit syrup, significantly minimum increase in pH (from 3.14 to 3.49, respectively), TSS (from 65.00 to 65.57 °B, respectively) and minimum decrease in titratable acidity (from 1.14 to 0.78, respectively), but maximum decrease in ascorbic acid content (17.90 and 14.03 mg/100ml,

respectively) were recorded in genotype G<sub>1</sub> (Purple rind). However, there was significantly maximum increase pH (from 3.69 to 4.04, respectively), TSS (from 65.00 and 66.03°B, respectively), and maximum decrease in titratable acidity (from 1.78 to 1.40 respectively), but minimum decrease in ascorbic acid content (16.90 and 14.29 mg/100ml, respectively) observed in genotype G<sub>2</sub> (Yellow rind).

##### 2. Effect of different recipes on pH, TSS, titratable acidity and ascorbic acid content of mandarin blended passion fruit syrup

In fresh and 150 days stored syrup, significantly minimum increase in pH (from 3.52 to 3.85, respectively), TSS (from 65.00 to 65.53°B, respectively), and minimum decrease in titratable acidity (from 1.85 and 1.50%, respectively) also in ascorbic acid (from 18.10 to 15.06) were recorded in

treatment B<sub>1</sub> (100% Passion fruit juice). However, there was significantly maximum increase in pH (from 3.41 to 3.76, respectively), TSS (65.00 and 66.30°B, respectively), and maximum decrease in titratable acidity (from 1.43 to 1.04%, respectively), also in ascorbic acid content (from 16.85 to 13.36 mg/100ml, respectively) found in treatment B<sub>6</sub> (50% Passion fruit juice + 50% Mandarin juice).

### 3. Interaction effect of different passion fruit genotypes and recipes on pH, TSS, titratable acidity and ascorbic acid content of mandarin blended passion fruit syrup

Significant interaction effect was observed between passion

fruit genotypes and recipes at fresh and 150 days of storage. The significantly minimum increase in pH (from 3.33 to 3.66, respectively), TSS (from 65.00 to 65.60°B, respectively), and maximum decrease in titratable acidity (from 1.53 to 1.15 %, respectively) also in ascorbic acid (from 17.70 to 14.49) were recorded in treatment G<sub>1</sub>B<sub>1</sub>. However, significantly maximum increase in pH (from 3.63 to 3.98, respectively), TSS (from 65.00 and 66.80°B, respectively), and maximum decrease in titratable acidity (1.53 and 1.15%, respectively) also in ascorbic acid content (16.50 and 13.26 mg/100ml, respectively) were observed in treatment G<sub>2</sub>B<sub>6</sub>.

**Table 1:** Effect of different passion fruit genotypes and recipes on pH, TSS, titratable acidity and ascorbic acid of mandarin blended passion fruit syrup

| Treatment                                                     | pH                |                   | Increase<br>in pH | TSS            |                 | Increase<br>in TSS °B | Titratable acidity |       | Decrease in<br>titratable<br>acidity °B | Ascorbic<br>acid |                   | Increase in<br>TSS °B |                   |                   |
|---------------------------------------------------------------|-------------------|-------------------|-------------------|----------------|-----------------|-----------------------|--------------------|-------|-----------------------------------------|------------------|-------------------|-----------------------|-------------------|-------------------|
|                                                               | Storage<br>(days) |                   |                   | Storage (days) |                 |                       | Storage (days)     |       |                                         | Storage (days)   |                   |                       |                   |                   |
|                                                               | 0 <sup>th</sup>   | 150 <sup>th</sup> |                   |                |                 |                       |                    |       |                                         | 0 <sup>th</sup>  | 150 <sup>th</sup> |                       | 0 <sup>th</sup>   | 150 <sup>th</sup> |
|                                                               |                   |                   |                   |                | 0 <sup>th</sup> |                       | 150 <sup>th</sup>  |       |                                         |                  | 0 <sup>th</sup>   |                       | 150 <sup>th</sup> | 0 <sup>th</sup>   |
| Passion Fruit Genotypes (Two)                                 |                   |                   |                   |                |                 |                       |                    |       |                                         |                  |                   |                       |                   |                   |
| G <sub>1</sub> (Purple rind)                                  | 3.14              | 3.49              | 0.35              | 65.00          | 65.57           | 0.57                  | 1.14               | 0.78  | 0.36                                    | 17.90            | 14.03             | 3.87                  |                   |                   |
| G <sub>2</sub> (Yellow rind)                                  | 3.69              | 4.04              | 0.35              | 65.00          | 66.03           | 1.03                  | 1.78               | 1.40  | 0.38                                    | 16.90            | 14.29             | 2.61                  |                   |                   |
| F test                                                        | NS                | Sig               | Sig               | NS             | Sig             | Sig                   | NS                 | Sig   | Sig                                     | NS               | Sig               | Sig                   |                   |                   |
| SE (m) ±                                                      | 0.019             | 0.017             | 0.002             | 0.006          | 0.003           | 0.003                 | 0.022              | 0.020 | 0.002                                   | 0.032            | 0.030             | 0.002                 |                   |                   |
| CD at 5%                                                      | -                 | 0.052             | 0.006             | -              | 0.010           | 0.009                 | -                  | 0.053 | 0.006                                   | -                | 0.085             | 0.006                 |                   |                   |
| Recipes                                                       |                   |                   |                   |                |                 |                       |                    |       |                                         |                  |                   |                       |                   |                   |
| B <sub>1</sub> (100% Passion fruit juice)                     | 3.52              | 3.85              | 0.33              | 65.00          | 65.53           | 0.53                  | 1.85               | 1.50  | 0.35                                    | 18.10            | 15.06             | 3.04                  |                   |                   |
| B <sub>2</sub> (90% Passion fruit juice + 10% Mandarin juice) | 3.33              | 3.66              | 0.33              | 65.00          | 65.58           | 0.58                  | 1.60               | 1.24  | 0.36                                    | 18.00            | 14.86             | 3.14                  |                   |                   |
| B <sub>3</sub> (80% Passion fruit juice + 20% Mandarin juice) | 3.47              | 3.81              | 0.34              | 65.00          | 65.63           | 0.63                  | 1.33               | 0.96  | 0.37                                    | 17.30            | 14.16             | 3.14                  |                   |                   |
| B <sub>4</sub> (70% Passion fruit juice + 30% Mandarin juice) | 3.42              | 3.76              | 0.34              | 65.00          | 65.78           | 0.78                  | 1.22               | 0.85  | 0.37                                    | 17.15            | 14.01             | 3.14                  |                   |                   |
| B <sub>5</sub> (60% Passion fruit juice + 40% Mandarin juice) | 3.34              | 3.69              | 0.35              | 65.00          | 65.98           | 0.98                  | 1.32               | 0.94  | 0.38                                    | 17.00            | 13.52             | 3.48                  |                   |                   |
| B <sub>6</sub> (50% Passion fruit juice + 50% Mandarin juice) | 3.41              | 3.76              | 0.35              | 65.00          | 66.30           | 1.3                   | 1.43               | 1.04  | 0.39                                    | 16.85            | 13.36             | 3.49                  |                   |                   |
| F test                                                        | NS                | Sig               | Sig               | NS             | Sig             | Sig                   | Sig                | Sig   | Sig                                     | Sig              | Sig               | Sig                   |                   |                   |
| SE (m) ±                                                      | 0.003             | 0.001             | 0.002             | 0.011          | 0.006           | 0.005                 | 0.035              | 0.033 | 0.002                                   | 0.054            | 0.052             | 0.002                 |                   |                   |
| CD at 5%                                                      | -                 | 0.004             | 0.005             | -              | 0.018           | 0.015                 | 0.108              | 0.101 | 0.007                                   | 0.158            | 0.151             | 0.007                 |                   |                   |

**Table 2:** Interaction effect of different passion fruit genotypes and recipes on pH, TSS, titratable acidity and ascorbic acid of mandarin blended passion fruit syrup

| Treatment                     | pH              |                   | Increase in pH | TSS             |                   | Increase in TSS °B | Titratable acidity |                   | Decrease in titratable acidity °B | Ascorbic acid   |                   | Increase in TSS °B |
|-------------------------------|-----------------|-------------------|----------------|-----------------|-------------------|--------------------|--------------------|-------------------|-----------------------------------|-----------------|-------------------|--------------------|
|                               | Storage (days)  |                   |                | Storage (days)  |                   |                    | Storage (days)     |                   |                                   | Storage (days)  |                   |                    |
|                               | 0 <sup>th</sup> | 150 <sup>th</sup> |                | 0 <sup>th</sup> | 150 <sup>th</sup> |                    | 0 <sup>th</sup>    | 150 <sup>th</sup> |                                   | 0 <sup>th</sup> | 150 <sup>th</sup> |                    |
| Passion Fruit Genotypes (Two) |                 |                   |                |                 |                   |                    |                    |                   |                                   |                 |                   |                    |
| G <sub>1</sub> B <sub>1</sub> | 3.33            | 3.66              | 0.33           | 65.00           | 65.50             | 0.50               | 1.60               | 1.28              | 0.32                              | 17.70           | 14.49             | 3.21               |
| G <sub>1</sub> B <sub>2</sub> | 3.15            | 3.49              | 0.34           | 65.00           | 65.51             | 0.51               | 1.40               | 1.07              | 0.33                              | 17.60           | 14.38             | 3.22               |
| G <sub>1</sub> B <sub>3</sub> | 3.12            | 3.46              | 0.34           | 65.00           | 65.53             | 0.53               | 1.03               | 0.69              | 0.34                              | 17.40           | 14.18             | 3.22               |
| G <sub>1</sub> B <sub>4</sub> | 3.10            | 3.44              | 0.34           | 65.00           | 65.57             | 0.57               | 1.00               | 0.65              | 0.35                              | 17.30           | 14.07             | 3.23               |
| G <sub>1</sub> B <sub>5</sub> | 3.05            | 3.40              | 0.35           | 65.00           | 65.60             | 0.60               | 0.90               | 0.54              | 0.36                              | 16.90           | 13.67             | 3.23               |
| G <sub>1</sub> B <sub>6</sub> | 3.10            | 3.45              | 0.35           | 65.00           | 65.80             | 0.80               | 0.90               | 0.52              | 0.38                              | 16.70           | 13.46             | 3.24               |
| G <sub>2</sub> B <sub>1</sub> | 3.78            | 4.11              | 0.33           | 65.00           | 65.50             | 0.50               | 2.10               | 1.78              | 0.32                              | 18.90           | 15.69             | 3.21               |
| G <sub>2</sub> B <sub>2</sub> | 3.73            | 4.07              | 0.34           | 65.00           | 65.67             | 0.67               | 1.87               | 1.54              | 0.33                              | 18.60           | 15.38             | 3.22               |
| G <sub>2</sub> B <sub>3</sub> | 3.70            | 4.04              | 0.34           | 65.00           | 65.77             | 0.77               | 1.80               | 1.46              | 0.34                              | 17.40           | 14.18             | 3.22               |
| G <sub>2</sub> B <sub>4</sub> | 3.71            | 4.05              | 0.34           | 65.00           | 66.03             | 1.03               | 1.73               | 1.38              | 0.35                              | 17.20           | 13.97             | 3.23               |
| G <sub>2</sub> B <sub>5</sub> | 3.57            | 3.92              | 0.35           | 65.00           | 66.37             | 1.37               | 1.63               | 1.27              | 0.36                              | 16.60           | 13.36             | 3.23               |
| G <sub>2</sub> B <sub>6</sub> | 3.63            | 3.98              | 0.35           | 65.00           | 66.80             | 1.80               | 1.53               | 1.15              | 0.38                              | 16.50           | 13.26             | 3.24               |
| F test                        | NS              | Sig               | Sig            | NS              | Sig               | Sig                | NS                 | Sig               | Sig                               | NS              | Sig               | Sig                |
| SE (m) ±                      | 0.046           | 0.044             | 0.002          | 0.017           | 0.009             | 0.008              | 0.051              | 0.049             | 0.002                             | 0.075           | 0.073             | 0.002              |
| CD at 5%                      | -               | 0.134             | 0.005          | -               | 0.027             | 0.022              | -                  | 0.141             | 0.007                             | -               | 0.214             | 0.005              |

## Discussion

### pH

In the present study, the pH of mandarin blended passion fruit syrup showed an increasing trend during the storage period of 150 days. The highest increase in pH (0.35) was recorded in treatments G<sub>1</sub> and G<sub>2</sub>, both increasing from 3.14 to 3.49 and 3.69 to 4.04 respectively. Among the interactions, G<sub>2</sub>B<sub>1</sub> (Yellow rind × 100% Passion fruit juice) recorded the maximum pH (4.11) after storage. The increase in pH during storage may be attributed to the precipitation of organic acids and buffering action of juice components. These findings are supported by the work of Singh *et al.* (2020) [30], who observed an increase in pH of passion fruit-based RTS beverages over 90 days of storage, particularly under ambient conditions. The results of the present study are consistent with the observations made by Hussain *et al.* (2011) [33]. In their study, they reported that the pH of blended juice increased as the concentration of apricot juice content increased.

### Total Soluble Solids (TSS)

A slight increase in TSS (°Brix) was observed across all treatments during storage. The increase was higher in G<sub>2</sub> (Yellow rind) (from 65.00 to 66.03°B) compared to G<sub>1</sub> (Purple rind) (from 65.00 to 65.57°B). Among interactions, G<sub>2</sub>B<sub>6</sub> (Yellow rind × 50% Mandarin juice) recorded the highest increase (1.80°B), from 65.00 to 66.80°B. The increase in TSS during storage can be attributed to the breakdown of complex carbohydrates into simpler sugars, hydrolysis of polysaccharides, and possible concentration due to moisture loss. Theja Angami *et al.* (2017) [34] conducted an experiment on dynamics of physico-biochemical changes in passion fruit varieties across maturity and they observed that there was gradual increase in TSS. Hamid *et al.* (2017) [7] conducted the study on development of syrup from mulberry under ambient and refrigerated conditions and reported that more increase in TSS was found in syrup stored under ambient conditions as compared to refrigerated storage conditions.

### Titrateable Acidity

Titrateable acidity exhibited a decreasing trend throughout the storage period. The decrease was more prominent in G<sub>1</sub> (Purple rind) from 0.78% to 0.36% (a 0.42% drop), compared to G<sub>2</sub> (Yellow rind) from 1.40% to 0.38%. Among interactions, the greatest decrease was recorded in G<sub>1</sub>B<sub>6</sub> (Purple rind × 50 % passion fruit + 50% Mandarin juice), where titrateable acidity declined from 0.90% to 0.52%. The reduction in acidity may be due to precipitation of organic acids, conversion into neutral compounds during storage, or microbial metabolism. Gaikwad *et al.* (2021) [5] conducted an experiment to study chemical changes and sensory qualities of guava syrup under different storage conditions and observed that, the acidity of guava syrup decreased throughout the storage period. Sahoo *et al.* (2015) [24] reported that, there was decrease in acidity of acid lime squash during storage.

### Ascorbic Acid

Ascorbic acid content declined significantly during storage. The highest initial ascorbic acid content was observed in G<sub>2</sub>B<sub>1</sub> (Yellow rind × 100% Passion fruit juice) (18.90 mg/100ml), which reduced to 15.69 mg/100ml after 150 days. This degradation may be due to oxidation of ascorbic

acid in the presence of light, oxygen, and temperature fluctuations during storage. Blends containing higher passion fruit juice showed better retention of ascorbic acid, possibly due to antioxidant compounds inherent in passion fruit. These results are consistent with Joshi *et al.* (2012) [9], who reported ascorbic acid losses in citrus-based beverages during storage. The interaction treatments G<sub>1</sub>B<sub>6</sub> and G<sub>2</sub>B<sub>6</sub> also showed lower ascorbic acid levels, supporting the observation that higher mandarin content may lead to more rapid degradation of vitamin C due to lower initial concentration and less antioxidant protection.

## Conclusions

In the present study, we have developed and evaluated the physicochemical attributes of mandarin blended passion fruit syrup using different genotypes of passion fruit and various blending recipes. Passion fruit, being a rich source of bioactive compounds and natural acids, offers a unique potential for beverage development. However, it is a seasonal fruit, abundantly available during specific months, and often remains underutilized in processed forms like syrup or wine. Despite its nutritional and functional value, limited scientific work has been undertaken on the formulation and storage behaviour of passion fruit-based blended products, especially in combination with citrus fruits like mandarin. Hence, there is a need to develop a standardized and scientific approach for preparing value-added products such as blended syrups from passion fruit.

Keeping these objectives in mind, the present investigation was carried out to study the effect of different passion fruit genotypes and blending recipes on the quality attributes of mandarin blended passion fruit syrup under storage conditions. The study revealed that significant variations existed among genotypes and recipes in terms of pH, TSS, titrateable acidity, and ascorbic acid, both at the initial stage and after 150 days of storage.

Mandarin blended passion fruit syrup prepared with 100 % juice from purple genotypes and stored at ambient conditions performed best up to 150 days, showing superior physicochemical qualities (pH, TSS, Titrateable acidity, ascorbic acid) and sensory attributes (aroma, colour, taste, appearance, overall acceptability) compared to other recipes. The results also emphasize the importance of selecting appropriate genotype and blending ratio for enhancing the quality and shelf life of the final product. This study provides a foundation for further research and commercial exploitation of passion fruit in the beverage industry, promoting value addition and minimizing post-harvest losses.

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## References

1. Bhardwaj RL, Pandey S. Juice blending - a boon for fruit processing industry. *Afr J Food Sci.* 2011;5(10):731-740.
2. Bhatnagar P, Jain MC, Mehta AK. Seasonal variations in physico-chemical composition of Nagpur mandarin

- (*Citrus reticulata* Blanco) fruit. Indian J Hortic. 2012;69(3):347-350.
3. Chowdhury MSH, Das SC. Formulation and evaluation of passion fruit beverage. Bangladesh J Agric Res. 2014;39(3):421-430.
  4. FAO. Fruit Juice Processing. Rome: Food and Agriculture Organization of the United Nations; 2004.
  5. Gaikwad DB, Sable DB, Sawant AM. Effect of storage conditions on chemical composition of guava syrup. Pharma Innov J. 2021;10(5):468-472.
  6. Gowda IND, Huddar AG. Effect of storage on chemical composition of passion fruit squash. South Indian Hortic. 2000;48(1-6):136-139.
  7. Hamid R, Bhat SA, Bhat MA. Development and storage studies of syrup from mulberry. Int J Agric Sci Res. 2017;7(6):393-398.
  8. Jagtap DD, Bhosale RA. Physico-chemical changes in preserved citrus juices during storage. Int J Process Post Harvest Technol. 2015;6(2):84-88.
  9. Joshi VK, Attri D. Physico-chemical and microbiological characteristics of apple and strawberry beverages fermented by *Saccharomyces cerevisiae* and *Torulaspora delbrueckii*. Braz Arch Biol Technol. 2012;55(4):593-603.
  10. Joshi VK, Bhutani VP, Attri D. Development of apricot wine and its evaluation. Haryana J Hortic Sci. 1990;19(1-2):49-56.
  11. Joy PP. Passion fruit (*Passiflora edulis*) - a potential crop for India. Hortic Res Station Bull, Kerala Agric Univ. 2010.
  12. Khandelwal RL, Saini DP. Changes in quality characteristics of citrus-pineapple blended juice during storage. Int J Food Ferment Technol. 2020;10(2):145-149.
  13. Kulkarni SG, Kudachikar VB, Prakash MNK. Studies on physicochemical and sensory characteristics of mango pulp storage with chemical preservatives. J Food Qual. 2011;34(2):89-102.
  14. Kumar A, Kumar R, Lal BM. Changes in physicochemical characteristics during fermentation and storage of guava wine. J Food Sci Technol. 2011;48(5):556-560.
  15. Kumar S, Reddy YTN. Passion fruit production in India: problems and prospects. Acta Hortic. 2008;849:221-224.
  16. Lal G, Siddappa GS, Tandon GL. Preservation of Fruits and Vegetables. New Delhi: Indian Council of Agricultural Research; 2015.
  17. Morton JF. Passion fruit. In: Fruits of Warm Climates. Miami (FL): 1987. p. 320-328.
  18. Najumudheen S. Optimum blend of pineapple and passion fruit juices for syrup preparation. M.Sc. (Agri.) Thesis. Calicut: Kerala Agricultural University; 2015.
  19. Nakasone HY, Paull RE. Tropical Fruits. Wallingford (UK): CAB International; 1998.
  20. Panda R, Dash SK, Mohapatra A. Effect of storage on physico-chemical and sensory characteristics of sweet orange-pineapple blended beverage. Int J Food Ferment Technol. 2013;3(1):91-96.
  21. Patil S, Thorat S, Sawant B. Storage studies of aonla and orange blended squash. Beverage Food World. 2013;40(3):55-57.
  22. Pawaskar AS, Patil PM, Chavan UD. Studies on preparation of passion fruit squash. Beverage Food World. 2011;38(7):62-64.
  23. Ranganna S. Handbook of Analysis and Quality Control for Fruit and Vegetable Products. New Delhi: Tata McGraw-Hill; 2010.
  24. Sahoo AK, Papade JN, Chandan PM. Studies on preparation of acid lime squash. Crop Weed Sci Soc (CWSS). 2012-13;11(1):-- (chemical analysis shows titratable acidity, non-reducing sugars, and ascorbic acid decreased with storage).
  25. Saxena A, Goyal A. Storage studies of mixed fruit RTS beverage and squash. J Food Process Preserv. 2008;32(1):21-32.
  26. Sharma PC, Joshi VK. Storage studies on strawberry wine. J Food Sci Technol. 2003;40(1):90-93.
  27. Shukla BD, Singh S, Sengar SS. Studies on preparation and preservation of guava nectar. Indian Food Packer. 1991;45(2):17-21.
  28. Asmita Khanal, Sandip Timilsina, Sunil Aryal, Susmita Khanal, Madhav Lamsal. Post-harvest study of mandarin in cold storage condition and ambient condition at Syangja, Nepal. Int J Hortic Food Sci 2023;5(2):17-22.  
DOI: 10.33545/26631067.2023.v5.i2a.172
  29. Shukla S, Sharma HK. Effect of thermal processing on antioxidant properties of guava-apple blended beverages. J Food Sci Technol. 2010;47(6):663-666.
  30. Singh R, Jatav M, Bhadoriya A. Genotypic evaluation of fruit yield and quality in passion fruit. Hort J. 2020;33(2):145-150.
  31. Thokchom I, Mandal G. Biochemical and sensory evaluation of citrus blended juice. J Pharmacogn Phytochem. 2017;6(5):1441-1445.
  32. Vyas HK, Kochhar A. Effect of storage on the nutritional quality of processed fruit beverages. Plant Foods Hum Nutr. 1993;43(3):215-221.
  33. Varghese NJ, Mukherjee S, Ivanova N, Konstantinidis KT, Mavrommatis K, Kyrpides NC, Pati A. Microbial species delineation using whole genome sequences. Nucleic acids research. 2015 Aug 18;43(14):6761-71.
  34. Hussain MI, González L, Souto C, Reigosa MJ. Ecophysiological responses of three native herbs to phytotoxic potential of invasive *Acacia melanoxylon* R. Br. Agroforestry systems. 2011 Oct;83(2):149-66.
  35. Angami Z. Tribals, empire and God: a tribal reading of the birth of Jesus in Matthew's gospel. Bloomsbury Publishing; 2017 Apr 6.