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Effect of Different Ratios of Apple-Carrot and Source of Sweetness on TSS, pH, Taste and Colour of Jam

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Abstract: ***The present study was to evaluate a suitable combination to check the effect of different ratios of Apple and Carrot along with source of sweetness on TSS, pH, taste and colour of jam in two replications. The treatments were Apple Pulp (100%) + Carrot pulp (0%), Apple Pulp (75%) + Carrot pulp (25%), Apple Pulp (50%) + Carrot pulp (50%), Apple Pulp (25%) + Carrot pulp (75%), Apple Pulp (0%) + Carrot pulp (100%). Two sources of sweetness were used i.e. Sugar and Honey. All the treatments were examined for physiochemical analysis i.e. Total Soluble Solids (TSS), pH and for organoleptic characters i.e. taste and colour at room temperature. Results revealed that sugar as a source of sweetness worked better than the honey for nearly all the treatments. Treatment Apple pulp 75% + Carrot pulp 25% from sugar source of sweetness have a beneficial impact on colour, taste, TSS and pH and hence it can be used to prepare the apple and carrot blended jam having all the organoleptic and physiochemical characters.***

Keywords: Apple, Carrot, Color, Honey, Jam, pH, Sugar, Taste, TSS

1. Introduction

Carrot (*Daucus carota L.*) is a rich source of many vitamins like A, C, β-carotene, B_1, B_2, B_3 and minerals like calcium, potassium, phosphorus and sodium. The unique profile of various micro-nutrients compounds in carrot makes it effective to increase its shelf life by preservation (Rozan 2017). Apples (*Malus domestica*) contains high amount of fibre, vitamin C, various antioxidants and a low calorie count on eating giving maximum fulfilment. Apple contains natural gelling agent as pectin which makes them desirable to be transformed into jam (Thakur *et al* 2022). Apples and carrots can be eaten raw or made as juice, squashes, jams, jellies, chutney etc. Jam can be defined as an intermediate moisture food prepared by cooking sugar with fruit pulp, pectin, acid and other ingredients to a sensible consistency. Jam is a semi-solid food product which contains 65% or more TSS and at least 45% pulp. Usually, a jam contains as much sugar as it contains fruit. The two parts are then cooked together to form a gel. As a gel, jam is neither a solid nor a liquid. In actual, jam preservation is a process of treating and handling food to stop or slow down fruit spoilage, loss of quality, edibility or nutritional value and thus allow for longer fruit storage. Jams generally have two types, the one which is developed from pulp of single fruit while second type is prepared by blending two or more fruits pulp referred as “Mixed Fruit Jam”.

2. Materials and Method

Experiment details:
The experiment was conducted to study physicochemical and sensory properties, effect of room temperature on overall quality, effect of different ratios of apple & carrot on acceptability of apple & carrot blended jam.

Preparation of Samples:
After peeling and cutting, apples & carrots were boiled separately in 30 ml/kg water at medium flame for 30 minutes. Manual removal of apple seeds was done. After the boiling process, grinding of apples and carrots was done to prepare a thick pulp. Further, apple and carrot pulp were combined in five different proportions and then all these five treatments were replicated in honey and sugar each.

Treatments:
- T_1: A_1C_0 - Apple Pulp (100%) + Carrot pulp (0%)
- T_2: A_2C_2 - Apple Pulp (75%) + Carrot pulp (25%)
- T_3: A_3C_3 - Apple Pulp (50%) + Carrot pulp (50%)
- T_4: A_4C_4 - Apple Pulp (25%) + Carrot pulp (75%)
- T_5: A_0C_1 - Apple Pulp (0%) + Carrot pulp (100%)

Sources of Sweetness
- S_1: Sugar
- S_2: Honey

Packaging and Storage of Jam
All treatments were packed in airtight plastic containers. They were kept in room temperature in dry and dark place. Treatments were analysed for physiochemical and Organoleptic characteristics. The treatments were examined after three days.

Physiochemical Analysis
Treatments were examined for physiochemical properties that are TSS and pH.

Total Soluble Solids (TSS)
The TSS of jam was measured by diluting little amount of jam in water and then by placing the sample on the sensor of digital refractometer. The TSS was calculated in ° Brix at the room temperature.

pH
pH was determined for the concentration of hydrogen ion. pH paper strips were used, to examine pH of jam.

Organoleptic Ratings
Sensory evaluation for taste and colour was evaluated. Experiment was replicated 02 times and scoring was done

by different judges. Using the hedonic readings and scores were given according to the likeability of judge out of maximum score being 10 and minimum being 1.

3. Results and Discussion

Total Soluble Solids (TSS)

The value for TSS of jam among sources of sweetness was more in S_1 (86.40) than S_2 (86.12). Among treatments, TSS was maximum in T_1 (86.55) followed by T_3 (86.50), T_2 (86.37), T_5 (86.12) and T_4 (85.75).In source and treatment interaction TSS in T_1S_1, T_3S_1 (87.00) was maximum and minimum values were observed in T_4S_1, T_4S_2 and T_5S_1 (85.75). Similar results were obtained by Parihar *et al* (2018) on Custard Apple Jam, Kumar *et al* (2015) on papaya jam and Mani and Mitra (2021) on effects of different natural herbs on Wood Apple jam. They found that initially at the time of preparation, total soluble solids showed different TSS values, and it was slightly increased after few days of storage at room temperature.

Table 1: Effect of various treatments and sources of sweetness on the TSS of Jam

Treatment/ Source of Sweetness	T_1	T_2	T_3	T_4	T_5	Mean
S_1	87.00	86.50	87.00	85.75	85.75	86.40
S_2	86.10	86.25	86.00	85.75	86.50	86.12
Mean	86.55	86.37	86.50	85.75	86.12	

pH

The value for pH of jam among sources of sweetness was more in S_1 (4.65) than S_2 (4.61). Among treatments, pH was maximum in T_3 (4.87) followed by T_1 (4.75), T_4 (4.62), T_5 (4.52) and T_2 (4.37). In source and treatment interaction T_1S_2, T_3S_1, T_4S_2 and T_5S_1 (5.00) showed the maximum pH, and minimum values were observed in T_5S_2 (4.05). Similar results were obtained by Rehman (2018) on preparation of strawberry jam and Jat *et al* (2022) on impact of sugar, sugar candy, jaggery and honey levels on physico-chemical changes of bourbon rose petal jam. It was observed that just after the processing, pH of jam was decreased at the end of storage period.

Table 2: Effect of various treatments and sources of sweetness on the pH of Jam

Treatment/ Source of Sweetness	T_1	T_2	T_3	T_4	T_5	Mean
S_1	4.50	4.50	5.00	4.25	5.00	4.65
S_2	5.00	4.25	4.75	5.00	4.05	4.61
Mean	4.75	4.37	4.87	4.62	4.52	

Taste

The organoleptic rating for taste of jam among sources of sweetness was more in S_1 (8.83) than S_2 (8.42). Among treatments, ratings for taste were maximum in T_3 (8.94) followed by T_1 (8.81), T_2 (8.58), T_5 (8.44) and T_4 (8.35). In source and treatment interaction T_3S_1 (9.50) showed maximum ratings followed by T_1S_2 (9.26) andthe least ratings were observed in T_5S_2 (8.11). Similar results were obtained by Rana *et al* (2021) on evaluation of quality characteristics and storage stability of mixed fruit jam and Shah *et al* (2015) on quality evaluation and preparation of apple and olive fruit blended jam. A decrease in taste of jam within a few days of storage was observed.

Table 3: Effect of various treatments and source of sweetness on the taste of Jam

Treatment/ Source of Sweetness	T_1	T_2	T_3	T_4	T_5	Mean
S_1	8.37	8.96	9.50	8.56	8.78	8.83
S_2	9.26	8.20	8.39	8.15	8.11	8.42
Mean	8.81	8.58	8.94	8.35	8.44	

Colour

The organoleptic rating for colour of jam among sources of sweetness was more in S_1 (8.54) than S_2 (8.34). Among treatments, maximum ratings were observed in T_3 (8.68) followed by T_1 (8.64), T_2 (8.32), T_4 (8.29) and T_5 (8.27). In source and treatment interaction, maximum ratings for colour were observed in T_3S_1 (8.86) followed by T_1S_2 (8.70) and minimum ratingswere observed in T_5S_2 (8.10). Similar results were obtained by Patel *et al* (2016) on banana – Pineapple blended jam, Hussain and Shakir (2010) on indigenous varieties of Apple-Apricot and Awolu e*t al* (2018) on jam production from blends of banana, pineapple and watermelon pulp and observed that the ratio of various fruits added in the jam significantly affected the colour of the jam.

Table 4: Effect of treatment and source of sweetness on the colour of Jam

Treatment/ Source of Sweetness	T_1	T_2	T_3	T_4	T_5	Mean
S_1	8.58	8.44	8.86	8.37	8.44	8.54
S_2	8.70	8.20	8.50	8.21	8.10	8.34
Mean	8.64	8.32	8.68	8.29	8.27	

4. Conclusion

The Sugar source of sweetness had a beneficial impact on TSS, pH, taste and colour of apple and carrot blended jam. Treatment T_3 (Apple pulp 50% + Carrot pulp 50%) with sugar source of sweetness (S_1) had a beneficial impact on colour, taste, TSS and pH slightly acidic which falls in acceptable range for all the kinds of jam. Hence, the combination of Apple pulp 50% + Carrot pulp 50% with sugar as source of sweetness may be used to prepare the apple and carrot blended jam.

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