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Juhi Krishna

M.Sc. Scholar, Department of Horticulture (Fruit Science), NAI, SHUATS, Prayagraj, Uttar Pradesh, India

VM Prasad

Professor, Department of Horticulture, NAI, SHUATS, Prayagraj, Uttar Pradesh, India

Vijay Bahadur

Associate Professor, Department of Horticulture, NAI, SHUATS, Prayagraj, Uttar Pradesh, India

Paramanand Prajapati

M.Sc. Scholar, Department of Horticulture (Fruit Science), NAI, SHUATS, Prayagraj, Uttar Pradesh, India

Corresponding Author:

Juhi Krishna

M.Sc. Scholar, Department of Horticulture (Fruit Science), NAI, SHUATS, Prayagraj, Uttar Pradesh, India

Standardization of blended sugar free fruit jam of guava (*Psidium guajava*) and papaya (*Carica papaya*)

Juhi Krishna, VM Prasad, Vijay Bahadur and Paramanand Prajapati

Abstract

A lab study was conducted in the Fruit Science and Technology Laboratory, College of Agriculture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (Allahabad), U. P. during academic session 2019-2021. Study was laid in Completely Randomized Design. Total 6 treatments was developed under the study and thrice replicated for better result regarding physicochemical properties, shelf life and organoleptic attributes at initial, 15, 30 and 45 DAS. The result showed that there was significant differences found among, TSS (%), total titrable acidity (%), ascorbic acid, pectin content, reducing Sugar, non Reducing Sugar, pH, shelf life and organoleptic attributes viz. colour and appearance, flavour and Taste, texture and overall acceptability. Physico-chemical properties indicated maximum value of TSS (68.59⁰B), total titrable acidity (27.26%), ascorbic acid (0.96 mg/100 g), pectin content (27.01%), reducing Sugar (24.44%), non Reducing Sugar (28.01%) and pH (3.93) in treatment T5 while minimum values of TSS (67.63⁰B), total titrable acidity (33.34%), ascorbic acid (0.85 mg/100 g), pectin content (22.24%), reducing Sugar (21.04%), non Reducing Sugar (24.24%) and pH (3.62) found in T0 at ambient temperature. Regarding organoleptic attributes of jam data showed maximum values of colour and appearance (7.73), flavour and Taste (7.59), texture (7.56) and overall acceptability (7.07) in treatment T5 while minimum values of colour and appearance (5.51), flavour and Taste (6.04), texture (6.29) and overall acceptability (6.21) in treatment T0 on Nine Point Hedonic Rating Scale. By viewing on various data regarding standardized jam it can be conclude that T5 found to be best treatment.

Keywords: Organoleptic, reducing sugar, non-reducing sugar, acidity, acceptability

Introduction

Guava (*Psidium guajava* L.) is the most important and commercially cultivated fruit crop belonging to the family Myrtaceae. It was originated in tropical America, stretching from Mexico to Peru and gradually it became a commercially significant crop in several countries. Guava is a hardy plant that grows in most of soil types varying from sandy loam to clay loam with a pH of 4.5 to 8.2. Guava fruit is rich in „vitamin-C“, minerals like calcium, iron and phosphorous with pleasant aroma and flavour (Dhaliwal and Dhillon 2003) [17].

Guava (*Psidium guajava*) is a common tropical fruit cultivated in many tropical and subtropical regions. The common guava *Psidium guajava* (lemon guava, apple guava) is a small tree in the myrtle family (Myrtaceae), native to Mexico, Central America, the Caribbean and northern South America. Related plants may also be called guavas; they belong to other species (in *Psidium*) or genera (in Myrtaceae), such as the pineapple guava, *Feijoa sellowiana*. In 2019, 55 million tonnes of guavas were produced worldwide, led by India with 45% of the total. Botanically, guavas are berries.

Jam is distinct as semi-solid mixture, obtained upon cooking the fruit soft tissue with sugar. Jam is an in-between moisture food prepared by boiling fruit pulp with sugar (sucrose), pectin, acid and other ingredients (additive, coloring, and flavoring materials) to a rationally thick evenness, firm enough to grip the fruit tissues in position. Jam should enclose more than 68.5% total soluble solids (TSS) plus at least 45% fruit whereas, the codex alimentations commission identify that the finished jam be supposed to contain more than 65% TSS. The highest stability of the anthocyanins was found when the jams were stored at fridge temperature (4 °C). The traditional jam showed higher stability than the pressured jams but also a bigger loss of anthocyanins during the production process (Gimenez *et al.*, 2001). Jam made from lye peeled segment did not develop bitterness whereas unpeeled segment developed bitterness (Sogi and Singh, 2001). In jam production, pectin can be obtained from fruit peels like orange which increases the dietary fiber of the end product and also reduces blood sugar when consume (Ozdogan and Yilmaz, 2011).

Materials and Methods

The Experimental work of “Standardization of blended sugar free fruit jam of guava (*Psidium guajava*) and papaya (*Carica papaya*)” was conducted in the Post Harvest Laboratory, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during the year 2020. The treatments were T0 (100% Guava pulp) T1 80% Guava pulp: 20% Papaya), T2 (60% Guava pulp: 40% Papaya), T3 (40% Guava pulp: 60% Papaya), T4 (20% Guava pulp: 80% Papaya), T5 (100% Papaya),

Climatic condition in the experimental site

The area of Prayagraj district comes under subtropical belt in the south east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to 46 °C- 48 °C and seldom falls as low as 4 °C- 5 °C. The relative humidity ranges between 20 to 94%. The average rainfall in this area is around 1013.4 mm annually. However, occasional precipitation is also not uncommon during winter months.

Experimental Findings

TSS (⁰Brix): TSS (⁰Brix) of the standardized jam was significantly increased with different variation in treatment. The maximum TSS value in fruit jam was recorded in T5 with 68.59 ⁰B followed by T4 with 68.41 ⁰B and the minimum was recorded in T0 (Control) with 67.63 ⁰B at 45 DAS of storing.

Ascorbic Acid (mg/100 g): Total titrable acidity increased significantly with various treatments. The maximum total ascorbic acid value in fruit jam was recorded in T5 with 27.26 followed by T4 with 24.79 and the minimum was recorded in T0 (Control) with 33.34 at 45 DAS of shelf life test.

Total titrable acidity (%): It is found that there is significantly increase in ascorbic acid. The maximum titrable acidity value in fruit jam was recorded in T5 with 0.96 followed by T4 with 0.94 and the minimum was recorded in T0 (Control) with 0.85 at 45 DAS of interval.

Pectin Content: Pectin content regarding developed jam showed maximum pectin content value in fruit jam was recorded in T5 with 2.71 followed by T4 with 2.51 and the minimum was recorded in T0 (Control) with 2.24 at 45 DAS

of shelf life estimation.

Reducing Sugar: There was significant differences between the treatments at Initial, 15, 30, and 45 DAS. The maximum total reducing sugar value in fruit jam was recorded in T5 with 24.44 followed by T4 with 23.57 and the minimum was recorded in T0 (Control) with 21.04 at 45 DAS of storing.

Non reducing Sugar: The maximum total reducing sugar value in fruit jam was recorded in T5 with 28.01 followed by T4 with 27.91 and the minimum was recorded in T0 (Control) with 24.24 at 45 DAS of interval.

pH: The maximum total pH value in fruit jam was recorded in T5 with 3.93 followed by T4 with 3.89 and the minimum was recorded in T0 (Control) with 3.62 after 45 DAS of shelf life evaluation.

Colour and Appearance: There was significantly deterioration found in colour and appearance of jam. The maximum colour and appearance value in fruit jam was recorded in T5 with 7.73 followed by T4 with 7.17 and the minimum was recorded in T0 (Control) with 5.51 after 45 DAS.

Flavour and Taste: A significantly deterioration observed in flavour and acceptance of standardized jam. The maximum flavour and taste value in fruit jam was recorded in T5 with 7.59 followed by T4 with 6.71 and the minimum was recorded in T0 (Control) with 6.04 after 45 DAS.

Texture: Texture of standardized jam was significantly decreased with various treatments. The maximum texture value in fruit jam was recorded in T5 with 7.56 followed by T4 with 7.19 and the minimum was recorded in T0 (Control) with 6.29 after 45 DAS.

Overall Acceptability: overall acceptability of developed jam was significantly decreased by different variations. The maximum overall acceptability value in fruit jam was recorded in T5 with 7.07 followed by T4 with 6.81 and the minimum was recorded in T0 (Control) with 6.21 after 45 DAS.

Table 1: Effect of different treatments on TSS ⁰B, Ascorbic acid (mg/100 g) Acidity % and Pectin content of fruit jam during storage period.

Treatment	TSS (⁰ B)				Ascorbic Acid (mg/100 g)				Acidity %				Pectin content			
	Initial	15 DAS	30 DAS	45 DAS	Initial	15 DAS	30 DAS	45 DAS	Initial	15 DAS	30 DAS	45 DAS	Initial	15 DAS	30 DAS	45 DAS
T ₀	67.33	67.42	67.53	67.63	32.62	32.77	33.10	33.34	0.90	0.89	0.87	0.85	3.14	2.81	2.57	2.24
T ₁	67.41	67.51	67.61	67.81	25.21	25.41	25.67	26.13	0.93	0.92	0.91	0.90	3.27	2.91	2.61	2.21
T ₂	67.49	67.60	67.67	67.77	30.92	31.26	31.35	31.35	0.96	0.94	0.93	0.91	3.34	2.91	2.71	2.41
T ₃	67.59	67.73	67.83	67.93	23.87	24.17	24.41	24.79	0.98	0.97	0.96	0.95	3.41	3.17	2.94	2.51
T ₄	68.03	68.13	68.21	68.41	22.97	23.26	23.66	23.99	1.00	0.98	0.97	0.94	3.54	3.14	2.81	2.51
T ₅	68.23	68.33	68.43	68.59	26.43	26.63	26.93	27.26	1.04	1.02	0.99	0.96	3.74	3.27	2.91	2.71
C.D. at 5%	0.314	0.312	0.322	0.475	4.202	4.165	4.131	4.128	0.01	0.01	0.01	0.01	2.34	2.23	2.47	2.62
SE (d)	0.148	0.147	0.152	0.224	1.985	1.967	1.951	1.95	0.04	0.04	0.04	0.04	3.33	2.98	2.71	2.43
F test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

Table 2: Effect of different treatments on reducing sugar, non reducing sugar, pH and Color and Appearance of fruit jam during storage period.

Treatment	Reducing sugar				Non Reducing sugar				pH				Color and Appearance			
	Initial	15 DAS	30 DAS	45 DAS	Initial	15 DAS	30 DAS	45 DAS	Initial	15 DAS	30 DAS	45 DAS	Initial	15 DAS	30 DAS	45 DAS
T ₀	12.81	15.47	18.51	21.04	33.47	30.21	27.67	24.24	3.34	3.42	3.52	3.62	5.86	5.76	5.62	5.51
T ₁	13.77	16.44	19.34	22.21	34.97	31.41	28.41	24.61	3.49	3.57	3.67	3.75	6.86	6.75	6.64	6.52
T ₂	13.64	16.84	20.07	22.91	35.64	31.81	29.11	26.31	3.52	3.60	3.70	3.79	6.66	6.56	6.43	6.33
T ₃	14.14	17.21	20.11	23.02	36.21	33.27	31.04	27.21	3.62	3.70	3.80	3.88	7.56	7.13	7.02	6.92
T ₄	14.37	17.54	20.61	23.57	36.84	33.64	30.91	27.91	3.60	3.70	3.80	3.89	7.83	7.39	7.28	7.17
T ₅	15.67	18.51	21.21	24.44	37.44	34.27	31.31	28.01	3.67	3.75	3.85	3.93	8.06	7.95	7.82	7.73
C.D. at 5%	1.278	1.397	1.457	1.754	2.334	2.203	2.474	2.602	0.174	0.175	0.167	0.155	0.528	1.180	1.554	1.498
SE (d)	0.603	0.66	0.688	0.829	35.633	31.8	29.1	26.3	0.082	0.082	0.072	0.073	0.249	0.557	0.734	0.708
F test	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S

Table 3: Effect of different treatments on score of flavor and taste, texture and overall acceptability of fruit jam during storage period.

Treatment	Flavor and Taste				Texture				Overall acceptability			
	Initial	15 DAS	30 DAS	45 DAS	Initial	15 DAS	30 DAS	45 DAS	Initial	15 DAS	30 DAS	45 DAS
T ₀	6.34	6.24	6.14	6.04	6.64	6.54	6.42	6.29	6.52	6.42	6.32	6.21
T ₁	6.62	6.530	6.43	6.33	6.92	6.47	6.33	6.23	6.72	6.62	6.52	6.41
T ₂	6.90	6.78	6.68	6.57	7.01	6.91	6.76	6.65	6.95	6.84	6.73	6.94
T ₃	7.21	6.74	6.64	6.52	7.21	7.10	6.96	6.81	7.27	6.84	6.73	6.60
T ₄	7.50	6.93	6.83	6.71	7.24	7.12	6.99	7.19	7.26	7.09	6.99	6.81
T ₅	7.99	7.79	7.75	7.59	7.91	7.82	7.69	7.56	7.43	7.33	7.18	7.07
C.D. at 5%	0.653	0.714	0.730	0.702	0.701	0.694	0.675	0.692	0.789	0.765	0.778	0.875
SE (d)	0.308	0.337	0.341	0.332	0.331	0.328	0.319	0.327	0.372	0.361	0.367	0.413
F test	S	S	S	S	S	S	S	S	S	S	S	S

Conclusion

From our findings it is concluded that the treatment T₅ (100% Papaya) was found to be best in the terms of TSS, Ascorbic acid (mg/100 g), Acidity %, Pectin Content (%), reducing sugar, non reducing sugar, pH, color and appearance, flavor and taste, texture, and overall acceptability.

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