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Research Article

Development and quality evaluation of mango and guava blended squash during storage

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Abstract

The study was taken out on the diverse ratio and storage period to evaluate the superiority of mango and guava blended squash. The future perspective of this study was to prepare a new product with good storage time and keeping quality with good colour and flavor. Squash was prepared from two diverse fruits by integration pulp, sugar and water in the ratio of 1:4:1 respectively. Potassium meta-bisulphite was added at 0.01% to all formulation. Every one sample were filled in two hundred and fifty ml plastic bottles and kept at room temperature for ninety days. The samples were evaluated for pH, total soluble solids, percent acidity, vitamin C, reducing and non-reducing sugars and sensory analysis for color, flavor and overall acceptability for three months in total with an interval of fifteen days for each reading. During storage, pH increased from 2.75 to 3.1, percent acidity increased from 1.45 to 1.27, total soluble solids increased from 46.67 to 48.30, ascorbic acid decreased from 36.30 to 34.34, reducing sugar increased from 14.17 to 15.73, non-reducing sugar dwindled from 28.30 to 26.67, color declined from 8.20 to 6.00, flavor value reduced from 8.50 to 6.10 and overall acceptability dwindled 8.00 to 6.10 throughout time of storage. The results displays that storage time and treatments had considerable influence ($p<0.05$) on physic-chemical and sensory assessment of Mango and guava blended squash. The squash sample M_3 was found excellent followed by M_7, while M_1 display bad results.

Keywords: Mango Guava blended squash; Potassium Meta-bisulphite; Sensory evaluation; Storage

Introduction

Myrtaceae is the family of guava having more than eighty genera and three hundred species; which are grown throughout the tropics and subtropics i.e in America, Asia and Australia **[1]**. The guava shows toleration in climates such as frost free **[2]**. Guava is the precursor of ascorbic acid, calcium, vitamin A and dietary fiber. Pectin is found in its flesh and used for jam and jellies making **[3]**.

In Pakistan guava occupies 3rd major position on cultivated basis fruit after citrus and mango. Combined area of Apples and peaches (4900hac) is less than its area. Dispersing in huge area of country shows

the reality of guava is drought tolerant, hardiest and keeps the pH among 4.5 to 8.5 [4]. Within Pakistan after bananas, mango and citrus its production takes 4th rank. However, its yield is 8.1 tones/hac, which is less than yield of 25 tonnes/ha [5]. Punjab districts climate and soil are suitable for guava crops, more occurs in these areas. In Larkana, Dadu Shikarpur and Hyderabad district of Sindh, smaller seed pear shaped guava grown. Famous areas in Khyber Pakhtunkhwa for guava production having good quality are Haripur, Dera Ismail Khan, Malakand, Bannu and Kohat 18,570 tons of guava are produced during 2004 to 2005 in Khyber Pakhtunkhwa under cultivation area of 1551 hectares. Of these 33% produced in Kohat [6].

Mango (*Mangiferaindica L.*) which belongs to the family *Anacadiacease*, is one of the main cultured fruit in the world [7]. Pakistan mango fabrication in 2009-10 was 1847,000 tones [8]. Mango is processed in several types of juices, chutneys, pickle, jams, nectars, squashes, mango toffees, canned mango slices and frozen mango slices and so on. It serves as a first-class basis of energy and provides vitamins C, A and minerals like Fe and phosphorus [9]. The fruit tissue of a matured mango contains up to 15% sugar and up to 1% protein. Additionally, mango has antioxidant, anticancer and anti-cvs abilities. Furthermore due to the high iron contents this fruit is a potential supplement for the handling of anemia, good diet for women during pregnancy and menstruation. Mangoes also contain amylase enzyme with stomach gentle properties analogous to pepsin that helps in digestion.

Squashes are syrupy juices containing some pulp. The term "jovial" is regularly worn interchangeably with squash. Fruit squashes have a lowly quantity of twenty five percent via capacity of fruit juice and are proposed to be drunk after dilution. Whereas Sulphur dioxide (SO_2) is the classic chemical addition for squashes, benzoic acid is used commonly. The acidities are generally in the mixture of 1.5 to 2.5 per w/v citric acid. The squash is packed into washed and pure bottles, exit with plan to one inch top space. The bottles are blocked with peak. The squash placed in safe for one to 1.5 years with no a large amount change in color or tastes [10].

Materials and methods

Reverberation, vigorous Mango and Guava of exact bulk and finest ripeness was purchased from the confined market of Peshawar and brought to the laboratories of Food Science and Technology, The University of Agriculture, Peshawar, Pakistan where this research work was conducted.

Preparation of samples

Subsequent to washing and arrangement, the stalks of Mango and Guava fruits were removed with the help of stainless steel knives.

Pulp extraction

Mango and Guava pulp was extracted by a pulper. Mango and Guava were put into the machine and pulp was obtained. The pulp was strained through muslin cloth and was used for squash preparation.

Preparation of squash

Mango and Guava squash was set by integration pulp, sugar and water in ratio of 1:4:1. Citric acid was supplementary to regulate the acidity to one percent along with 0.05% Carboxyl Methyl Cellulose (CMC) to avoid separation [11].

Packaging and storage of squash

The ready squash samples were packed in 250 ml capability obvious plastic bottles and were reserved at room temperature for Physicochemical and Sensory analysis at intervals of fifteen days for entire time of three months.

Physico-chemical analysis

Digital pH meter was used to determine the pH according to standard method of [12]. Total soluble solids (TSS) were determined by using hand refractometer at room temperature [12]. Acidity was determined by standard method [12]. Ascorbic acid was determined by the direct colorimetric method using 2,6-dichlorophenol-

indophenols as decolorizing agent by ascorbic acid in sample extract and in standard ascorbic acid solution [12]. Reducing and non-reducing sugars were determined by Lane Eynon method [12].

Organoleptic evaluation

The samples of Mango and Guava blended squash were studied organoleptically for color, flavor, and overall acceptability by ten judge's panel. Organoleptic study was carried out at the storage intervals of fifteen days with an overall period of three months. The evaluation was conceded out by using 9 points hedonic scale of [13].

Statistical analysis

Every one data concerning treatments and storage period were statistically analyzed by means of Complete Randomized Design (CRD) as suggested by [14] and the means were divided by applying LSD Test at five percent probability level as described by Steel and Torrie [15].

Results and discussion

Physico-chemical analysis

Mango and Guava blended squash was ready by mixing pulp, sugar and H_2O in the proportion of 1:4:1 respectively. Then the squash samples were evaluated physicochemical for vitamin C, pH, percent acidity, Total soluble solids, reducing and non-reducing sugars and organoleptic characteristics that is color, flavor and overall acceptability. These parameters are discussed as under:

The statistical analyses showed that the treatments and storage time had a significant ($p<0.05$) influence on pH of Mango and Guava blended squash through storage at room temperature. (Table 1). pH is responsible for flavors and preservation of Mango and guava blended squash. In the beginning, of an experiment, the pH values of the samples were noted as 2.82, 2.71, 2.70, 2.79, 2.76, 2.77 and 2.72 which gradually increase to 3.31, 3.13, 2.99, 3.12, 3.11 3.10 and 3.04 correspondingly during 90 days of storage time at room temperature. The mean pH values greatly ($p<0.05$) enlarge from 2.75 to 3.11. For treatments, maximum value for was noted in M_1 (3.07), followed by M_3 (2.96), while minimum value for mean was noted in M_3 (2.84), followed by M_7 (2.86). Maximum percent increase was noted in M_1 (14.80%), followed by M_1 (13.42%). While minimum percent reduce was noted in M_3 (9.70%), followed by M_7 (Table 1). Equivalent observation was observed by [16] in Kinnow mandarin ginger squash. pH of fruits and vegetables changes it might be due to heat treatment on biochemical substances, decrease of respiration and metabolic process. In the same way increase in pH during storage period of the squash was observed by [17].

The statistical analysis showed that the treatments and storage had a substantial ($p<0.05$) influence on titratable acidity of Mango and guava squash through storage at room temperature. (Table 2). Initially the titratable acidity of the samples were 1.43, 1.45, 1.46, 1.45, 1.47, 1.48, 1.47 percent which were gradually decreased to 1.20, 1.28, 1.30, 1.26, 1.29, 1.29 and 1.30 percent correspondingly during three months of storage at room temperature. The mean values of acidity substantially ($p<0.05$) decline from 1.45 to 1.30. For treatments, maximum mean value was observed in M_3 (1.39), followed by M_6 (1.38) while minimum value for mean was noted in M_1 (1.32), followed by M_4 (1.37). Maximum percent decreased was noted in M_1 (16.08%), followed by M_4 (13.10%) and lowest percent decrease was noted in M_3 (10.96%), followed by M_7 (11.56%) (Table 2). This dwindle may be because of acid hydrolysis of polysaccharides and non-reducing sugars to their monomers where the acid is used for change them to six carbon sugars or polymers in the existence of metal ions. Similar result was reported by [18] in amla juice. Decline in acidity during the storage period of the beverages was observed by [19] in flavored tamarind Ready to serve beverages and [20] in Ready to serve beal guava beverage.

The statistically analysis showed that the treatments and storage intervals had a substantial ($p<0.05$) influence on Total

soluble solids of Mango and Guava squash through storage at room temperature. (Table 3). At the begin of an experiment, the TSS values of the samples were recorded as, 47.50, 47.60, 47.30, 47.20, 45.60, 45.70 and 45.80, ^{0}brix which were gradually increased to 50.10, 49.10, 48.50, 48.90, 47.10, 47.40 and 47.00^{0}brix correspondingly during three months of storage. The mean Total soluble solids values considerably ($p<0.05$) enlarge from 46.67 to 48.30 ^{0}brix during storage. For treatments maximum mean values was eminent in M_1 (48.60), followed by M_2 (48.30) while minimum mean value was noted in M_5 (46.30), followed by M_7 (46.30). Maximum percent enlarge was noted in M_1 (5.19%), followed by M_6 (3.59%) while minimum percent increase was noted in M_3 (2.47%), followed by M_7 (2.55%) (Table 3). This is enlarge during storage period due to conversion of sucrose into (glucose fructose). These results are in conformity with **[17]**. Comparable explanations were recorded by **[21]** in tamarind syrup and **[16]** in ginger mixed kinnow mandarin squash.

The statistical analysis showed that the treatments and storage intervals had a substantial ($p<0.05$) influence on vitamin C content of Mango and guava squash throughout storage at room temperature (Table-4). At the begin of an experiment, the ascorbic acid content of the samples were 33.05, 34.40, 34.51, 34.5, 39.30, 39.25 and 39.10 mg/100g, which were step by step decreased to 28.40, 32.50, 33.50, 33.00, 37.75, 37.33 and 37.90, mg/100g correspondingly throughout three months of storage time at room temperature. The mean values of vitamin C content considerably ($p<0.05$) declined as of 36.30 to 34.34 mg/100g. For treatments, maximum mean value was noted in M_6 (38.93), followed by M_7 (38.58). While minimum mean value was noted in M_1 (31.26), followed by M_2 (33.37). Maximum percent reduce was noted in M_1 (14.07%), followed by M_2 (5.52%), while minimum percent reduce was noted in M_3 (2.93%), followed by M_7 (3.06%) (Table 4). The loss in ascorbic acid due to environmental factors like high temperature, heat and light. Slowly dwindle of vitamin C content may be due to oxidative destruction of ascorbic acid in the presence of molecular oxygen by enzymes **[22]**. Comparable details for diminish in vitamin C content was observed in aonla juice by Gajanana **[18]**, in rose apple aonla squash by **[23]**.

The statistical analysis showed that the treatments and storage time had a substantial ($P<0.05$) influence on reducing sugars of Mango and guava squash throughout storage at ambient temperature. (Table-5). At the begin of an experiment the reducing sugar of the samples were 15.27, 14.91, 14.39, 14.39, 13.42, 13.40 and 13.43, which were gradually increased to 18.30 ,16.35 , 15.90, 13.50, 14.90, 14.50 and 14.00 respectively during 90 days of storage period at room temperature. Mean values of reducing sugar significantly ($P<0.05$) enlarged from 14.17 to 15.73 from beginning to end storage. For treatments, maximum value for mean was noted in M_1 (16.64), followed by M_2 (15.43), while minimum value for mean was noted in M_7 (13.66), followed M_6 (14.00). Maximum percent increase was noted in M_1 (16.56%); followed by M_3 (11.17%) while minimum percent increase was noted in M_3 (8.81%), followed by M_4 (9.50%) (Table 5). It might been dorsed to the acid splitting by water of polysaccharides which resulted in expansion in soluble sugars content. Increase can be accredited to the hydrolysis of non-reducing sugars due to processing and storage. Comparable findings were observed by **[21]** in tamarind syrup and **[24]** in mango lemon grass beverage in total and reducing sugars and decline in non-reducing-sugars throughout storage.

The statistical analysis showed that the treatments and storage intervals had a substantial ($p<0.05$) influence on non-reducing sugars of Mango and Guava squash throughout storage at room temperature. (Table 6). At the begin of an experiment, the non-reducing sugars of the

samples were 29.22, 28.12, 28.30, 28.30, 27.20, 28.40 and 28.60 which were slowly decreased to 26.0, 26.50, 27.37, 26.84 respectively during 90 days of storage time at room temperature. The mean values of non-reducing sugars drastically ($p<0.05$) decline as of 28.30 to 26.67 throughout storage. For treatments, maximum value for mean was noted in M_7 (28.26), followed by M_1 (27.83) while minimum mean value was noted in followed by M_5 (26.41), followed by M_2 (27.41). Highest percent diminish was noted in M_1 (11.02%), followed by M_5 (6.25%), whereas lowest percent diminish was noted in M_3 (3.29%), followed by M_7 (3.84%) (Table 6). The dwindled due to the inversion of non-reducing sugars to reducing sugars. These consequences are in close conformity with the conclusion of **[25]**, who showed that the contents of sucrose in the fruit was tainted to glucose and sucrose throughout storage.

The samples of Mango and Guava squash of this research work stored at room temperature were examine subjectively for colour, flavour and overall acceptability at fifteen days intervals, for an entire time of three months. The organoleptic analysis was conceded by means of 9 points hedonic scale of **[13]**.

The statistical analysis showed that the treatments and storage intervals had a substantial ($p<0.05$) influence on the colour of mango and guava blended squash during storage at room temperature. (Table 7). Firstly the mean score of judges for colour of samples were 8.90, 8.70, 8.60, 8.40, 7.40, 7.70 and 8.00 which were progressively decreased to 3.70, 6.80, 7.00, 6.60, 5.70, 6.20 and 6.50 correspondingly during storage. The overall mean score of judges for colour drastically ($p<0.05$) decline from 8.24 to 6.007. For treatments, maximum value for mean was noted in M_3 (7.90), followed by M_2 (7.70), while minimum value for mean was noted in M_1 (6.20), followed by M_5 (6.60). Maximum percent dwindle was noted in M_1 (58.43%), followed by M_5 (22.97%), while minimum mean score was noted in M_3 (18.60%), followed by M_7 (18.75%) (Table 7). Decrease in color and flavor due to bacterial fermentation in fruit beverages could cause off color and flavor. These conclusions of the research work are also in close conformity with the findings of **[26]**, who observed a reduction in color of fruit flavored beverages. Similarly these findings are also in concurrence with the results of **[27]**, who showed losses in color of kinnow and strawberry blended juice during storage of three months.

The statistical analysis showed that the treatments and storage intervals had a substantial ($p<0.05$) influence on flavour of Mango and guava blended squash throughout storage at room temperature (Table 8). Initially the mean score of judges for flavour of samples were 9.00, 8.80, 8.70, 8.30, 8.20, 8.30 and 8.40 which were gradually decreased to 3.50, 6.40, 7.20, 6.00, 6.30, 6.60 and 6.90 correspondingly through storage. The overall mean score of judges for flavor drastically ($p<0.05$) decline from 8.52 to 6.12. For Treatments, maximum value for mean was noted in sample M_3 (8.00), followed by M_7 (7.70), while minimum value for mean was noted in sample M_1 (6.10), followed M_4 (7.20). Maximum percent dwindled was noted in M_1 (61.11%), followed M_4 (27.71%), while minimum mean score was noted inM_3 (17.24%), followed M_7 (17.85%) (Table 8). These conclusion are in close agreement with the results by **[28]**, who reported reduction in organoleptic attributes of pasteurized orange juices, kept in transparent glass bottles. Similarly, these findings are also in agreement with the results of **[29]**, who noted a loss in flavour of guava squash during storage of 90 days.

The statistical analysis showed that the results of treatments and storage intervals had a substantial ($p<0.05$) influence on overall acceptability of mango and guava blended squash throughout storage at room temperature which is presented in (Table 9). At the start the mean score of judges for overall acceptability of samples were 8.00, 8.00, 8.00, 8.00, 8.00, 8.00 and 8.00 which

were gradually decline to 3.80, 6.30, 6.80, 6.40 and also 3.70, 6.20, 6.60 and 6.80 correspondingly through storage. The overall mean score of judges for overall acceptability substantially ($p<0.05$) decline from 8.00 to 6.15. For treatments, maximum value for mean was noted in M_7 (7.50), followed M_3 (7.40), while minimum value for mean was noted in M_1 (5.90), followed M_5 (7.10). Maximum percent reduce was noted in M_1 (52.50%), followed M_5 (22.50%), while minimum mean score was noted in M_3 (15.00), followed by M_7 (15.00) (Table 10). Decrease due to increasing storage time and temperature cause progressive degradation which lead to dwindled in overall acceptability. These consequences are in close conformity with the results of [30], who noted that rising storage time and temperature results in slow degradations which ultimately results in reduce in overall acceptability. Similarly, these findings are also in accordance with the results of [29], who reported a reduction in overall acceptability of guava squash during storage of 90 days.

Table 1. pH of mango and Guava blended squash during storage

Treatments	Storage Intervals							% Inc	Means
	Initial Day	15	30	45	60	75	90		
M_1	2.82	2.9	2.98	3.08	3.17	3.24	3.31	14.80	3.07a
M_2	2.71	2.78	2.85	2.89	2.97	3.05	3.13	13.42	2.91c
M_3	2.7	2.75	2.79	2.84	2.89	2.93	2.99	9.70	2.84d
M_4	2.79	2.86	2.91	2.96	3.02	3.07	3.12	10.58	2.96b
M_5	2.76	2.81	2.86	2.92	2.97	3.05	3.11	11.25	2.93b
M_6	2.77	2.81	2.88	2.91	2.98	3.06	3.1	10.65	2.93b
M_7	2.72	2.75	2.79	2.86	2.92	2.97	3.04	10.53	2.86b
Means	2.76a	2.81b	2.87c	2.93d	2.99e	3.06f	3.12g		

Figures with diverse small letters are statistically diverse ($P<0.05$)

Table 2. Acidity of mango and guava blended squash during storage

Treatments	Storage Intervals							% Dec	Means
	Initial Day	15	30	45	60	75	90		
M_1	1.43	1.4	1.38	1.32	1.3	1.26	1.2	16.08	1.32d
M_2	1.45	1.43	1.42	1.39	1.35	1.31	1.28	11.72	1.37c
M_3	1.46	1.44	1.43	1.4	1.37	1.34	1.3	10.96	1.39ab
M_4	1.45	1.43	1.42	1.38	1.36	1.3	1.26	13.10	1.37c
M_5	1.47	1.45	1.4	1.35	1.33	1.31	1.29	12.24	1.37c
M_6	1.48	1.45	1.43	1.38	1.34	1.32	1.29	12.84	1.38bc
M_7	1.47	1.46	1.44	1.41	1.39	1.36	1.30	11.56	1.40a
Means	1.45a	1.43ab	1.41c	1.37d	1.34e	1.31f	1.27g		

Figures with diverse small letters are statistically diverse ($P<0.05$)

Table 3. Total soluble solids of mango and guava blended squash during storage

Treatments	Storage Intervals							% Inc	Means
	Initial Day	15	30	45	60	75	90		
M_1	47.5	47.8	48	48.5	48.9	49.3	50.1	5.19	48.5a
M_2	47.6	47.8	48	48.2	48.5	48.9	49.1	3.05	48.3b
M_3	47.3	47.5	47.7	47.9	48.1	48.3	48.5	2.47	47.9c
M_4	47.2	47.5	47.8	48	48.3	48.6	48.9	3.48	48.0c
M_5	45.6	45.8	46.1	46.2	46.5	46.8	47.1	3.18	46.3d
M_6	45.7	45.9	46.2	46.3	46.8	47.1	47.4	3.59	46.4d
M_7	45.8	45.9	46	46.1	46.4	46.9	47.0	2.55	46.3d
Means	46.67g	46.88f	47.11e	47.31d	47.64c	47.98b	48.3a		

Figures with diverse small letters are statistically diverse ($P<0.05$)

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Table 4. Ascorbic Acid of mango and guava blended squash during storage

Treatments	Storage Intervals							% Dec	Means
	Initial Day	15	30	45	60	75	90		
M_1	33.05	32.8	32.4	32	31	29.2	28.4	14.07	31.26d
M_2	34.4	34.1	33.7	33	33.1	32.8	32.5	5.52	33.37c
M_3	34.51	34.4	34.3	34.1	34.00	33.8	33.5	2.93	34.09b
M_4	34.57	34.3	34.2	34.00	33.7	33.3	33	4.54	33.87bc
M_5	39.3	39.15	38.9	39.5	39.12	38.83	38.52	3.94	38.93a
M_6	39.2	39.05	38.72	38.41	38.22	37.75	37.33	4.77	38.38a
M_7	39.1	39	38.8	38.61	38.43	38.27	37.90	3.06	38.58a
Means	36.30a	36.11ab	35.86abc	35.66bc	35.36cd	34.85de	34.34e		

Figures with diverse small letters are statistically diverse (P<0.05)

Table 5. Reducing sugar of mango and guava blended squash during storage

Treatments	Storage Intervals							% Inc	Means
	Initial Day	15	30	45	60	75	90		
M_1	15.27	15.5	16	16.5	17.1	17.8	18.3	16.56	16.63a
M_2	14.91	15	15.3	15.5	15.9	15.1	16.35	8.81	15.43b
M_3	14.39	14.5	14.8	15	15.4	15.8	16.2	11.17	15.15bc
M_4	14.39	14.65	14.8	14.99	15.21	15.41	15.9	9.50	15.05c
M_5	13.42	13.62	13.83	14.13	14.34	14.56	14.9	9.93	14.11d
M_6	13.4	13.6	13.79	14.1	14.27	14.39	14.5	7.59	14.00de
M_7	13.43	13.2	13.6	13.8	13.7	13.89	14	4.07	13.66be
Means	14.17f	14.29ef	14.58de	14.86cd	15.13bc	15.27b	15.73a		

Figures with diverse small letters are statistically diverse (P<0.05)

Table 6. Non-reducing sugar of mango and guava blended squash during storage

Treatments	Storage Intervals							% Dec	Means
	Initial Day	15	30	45	60	75	90		
M_1	29.22	29	28.5	28	27	27.1	26	11.02	27.83b
M_2	28.12	28	27.85	27.5	27.1	26.8	26.5	5.76	27.41c
M_3	28.3	28.2	28.05	27.85	27.6	27.45	27.37	3.29	27.83b
M_4	28.3	28.05	27.8	27.5	27.25	27.05	26.84	5.16	27.54bc
M_5	27.2	27.1	26.8	26.4	26.1	25.8	25.5	6.25	26.41d
M_6	28.4	28.2	28	27.85	27.5	27.37	27	4.93	27.76b
M_7	28.6	28.5	28.4	28.28	28.14	28.05	27.5	3.84	28.26a
Means	28.30a	28.15ab	27.91bc	27.62c	26.24d	27.08d	26.67e		

Figures with diverse small letters are statistically diverse (P<0.05)

Table 7. Color of mango and guava blended squash during storage

Treatments	Storage Intervals							% Dec	Means
	Initial Day	15	30	45	60	75	90		
M_1	8.9	8	7.2	6.1	5.3	4.5	3.7	58.43	6.2d
M_2	8.7	8.3	8	7.7	7.4	7	6.8	21.84	7.7a
M_3	8.6	8.4	8.1	7.9	7.7	7.3	7	18.60	7.9a
M_4	8.4	8.1	7.8	7.5	7.2	6.9	6.6	21.43	7.5ab
M_5	7.4	7.2	6.9	6.7	6.4	6	5.7	22.97	6.6cd
M_6	7.7	7.5	7.3	7	6.7	6.4	6.2	19.48	6.97bc
M_7	8	7.8	7.6	7.4	7.1	6.9	6.5	18.75	7.4a
Means	8.2a	7.9ab	7.5bc	7.1cd	6.8de	6.42ef	6.07f		

Figures with diverse small letters are statistically diverse (P<0.05)

Table 8. Flavor of mango and guava blended squash during storage

Treatments	Storage Intervals							% Dec	Means
	Initial Day	15	30	45	60	75	90		
M_1	9	8	7.3	6	5	4.2	3.5	61.11	6.1c
M_2	8.8	8.4	8.1	7.7	7.3	6.8	6.4	27.27	7.6ab
M_3	8.7	8.5	8.2	8	7.7	7.4	7.2	17.24	8.0a
M_4	8.3	8	7.6	7.1	6.7	6.4	6	27.71	7.2b
M_5	8.2	8	7.7	7.4	7.1	6.7	6.3	23.17	7.3a
M_6	8.3	8.1	7.8	7.6	7.3	6.9	6.6	20.48	7.5a
M_7	8.4	8.2	8	7.8	7.5	7.3	6.9	17.85	7.7ab
Means	8.5a	8.1ab	7.8bc	7.3bc	6.9de	6.5ef	6.12f		

Figures with diverse small letters are statistically diverse (P<0.05)

Table 9. Overall acceptability of mango and guava blended squash during storage

Treatments	Storage Intervals							% Dec	Means
	Initial Day	15	30	45	60	75	90		
M_1	8	7.3	6.6	6	5.2	4.5	3.8	52.50	5.9b
M_2	8	7.8	7.6	7.3	6.9	6.6	6.3	21.25	7.2a
M_3	8	7.8	7.6	7.4	7.2	7	6.8	15.00	7.4a
M_4	8	7.7	7.4	7.1	6.9	6.6	6.4	20.00	7.1a
M_5	8	7.7	7.5	7.2	6.8	6.5	6.2	22.50	7.1a
M_6	8	7.7	7.6	7.4	7.1	6.8	6.6	17.50	7.3a
M_7	8	7.9	7.8	7.6	7.4	7.2	6.8	15.00	7.5a
Means	8.0a	7.7ab	7.4bc	7.1cd	6.7de	6.4ef	6.1f		

Figures with diverse small letters are statistically diverse (P<0.05)

Conclusion and recommendations

It is concluded from this research work that sample M_3 (700ml mango and 300ml guava) which was treated with 0.1% potassium meta bisulphite as chemical preservative was found best on the basis of physicochemical analysis such as pH (2.84d), %acidity (1.39ab), Total soluble solids (47.9c ^{0}Brix), Reducing sugar (15.15bc%), Non reducing sugar (27.83b%), Ascorbic acid(34.09b mg/100g) and sensory evaluation such as color (7.9a), flavor (8.0a) and overall acceptability (7.4a) as compared to other treatments. From this study it is concluded that mango and guava blended squash M_3 (700ml mango and 300ml guava) were accepted both organoleptically and physicochemically as compared to others.

Authors' contributions

Conceived and designed the experiments: MN Din & S Wahab, Performed the experiments: MN Din , Analyzed the data: MN Din & S Wahab, Contributed reagents/ materials/ analysis tools: S Wahab, A Muhammad, H Bilal, MU Din, H Nawaz, SA Khan & QA Sultan, Wrote the paper: MN Din.

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